



The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Agricultural Adaptation to Urbanization: Farm Types in Northeast Metropolitan Areas

Ralph E. Heimlich and Charles H. Barnard

Metropolitan agriculture is not homogeneous. This paper delves beneath metropolitan county averages using data on individual farms in the Northeast classified into three statistically distinct types. A small group of adaptive farms profit from intensive production on smaller acreage to accommodate themselves to the urban environment. Traditional farms have increased costs and pressures on their more extensive operations without compensating increases in revenue from better-adapted enterprises. A large group of recreational farms subsidize small-farm activities from nonfarm income. Operating characteristics of each farm type are presented and their importance to metropolitan agriculture is assessed. Implications for preserving farming and farmland in the Northeast are drawn.

Urbanization is one of the most important factors influencing agriculture. The area influenced by urbanization, as approximated by Metropolitan Statistical Areas (MSAs) defined by the Bureau of the Census, now contains 16% of U.S. land area and 75% of the U.S. population (U.S. Bureau of the Census). Metro areas are important in the Northeast, accounting for 39% of land area and containing 51% of farms (Figure 1; Heimlich 1987). Previous studies showed that farms in metro areas are generally smaller, produce more per acre, have more diverse enterprises, and are more focused on high-value production than nonmetro farms (Heimlich and Brooks; Heimlich 1988). Farms in metro areas were also found to have a generally stronger financial position than nonmetro farms (Ahearn and Banker). In this article, we present a conceptual model to help discuss the adaptation of agriculture to the forces of urbanization. We test the hypothesis, derived from the model, that a variety of statistically distinct farm types coexist within metro areas that have evolved from pursuing different adaptations to urban pressures.

Metro farm characterizations in earlier studies were based on aggregated county statistics that

may be misleading if several distinct types of farms coexist in the urbanizing metropolitan environment. This paper delves beneath the metro county averages using data on individual farms in the Northeast classified into three types: recreational, adaptive, and traditional. Operating characteristics of each farm type are presented. The importance of each farm type to metropolitan agriculture is assessed. Implications for preserving farming and farmland in the Northeast are drawn.

Agricultural Adaptation and Farm Types

The increasingly metropolitan character of the United States presents agriculture with both problems and opportunities. Growth of metro areas has effects on agriculture, exercised primarily through markets in which farmers buy and sell, and through local government institutions, which exercise control over property taxes and land use (Heimlich and Brooks). Many of these influences simultaneously bring pressure on farmers to adapt and offer farmers opportunities for change. Different kinds of adaptation result in different kinds of farms.

How do these adaptations occur? New development to support growing populations competes with agriculture in the land market, bidding up land prices. Property taxes increase, which raises the cost of keeping farmland in agriculture. Landowners may seek enterprises and markets that offer returns to land more commensurate with those

Ralph E. Heimlich is an economist, Water and Agricultural Policy Division, U.S. Environmental Protection Agency (EPA). Charles H. Barnard is an agricultural economist, Agricultural and Rural Economy Divisions, Economic Research Service, U.S. Department of Agriculture in Washington, DC. The views presented here are the authors' and do not necessarily represent policies or views of the U.S. EPA or U.S. Department of Agriculture.

MSA and Urban Counties

1985 MSA Definition

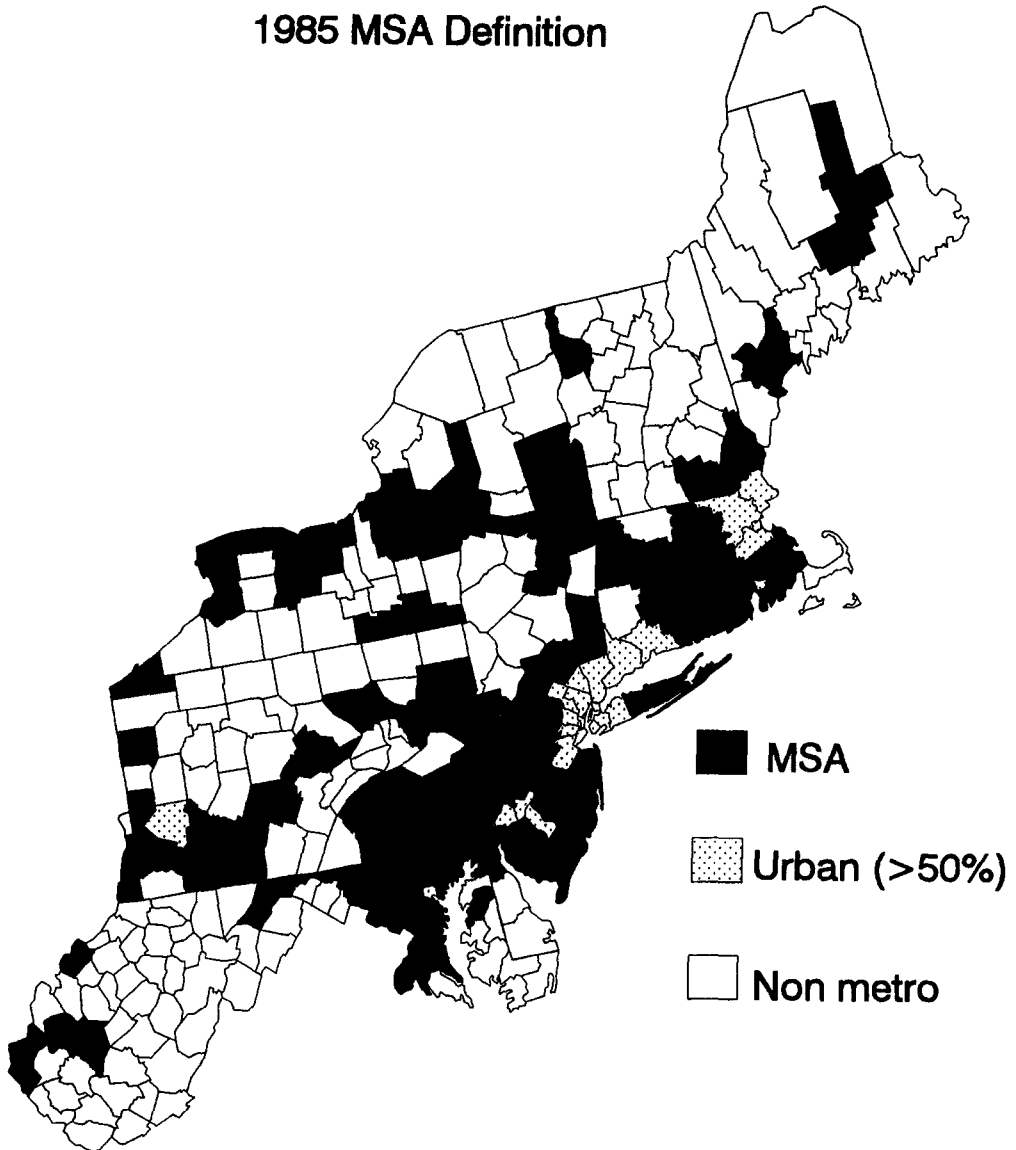


Figure 1. Map of Northeastern Metro Areas

from development. Landowners may also sell off less productive woodlot and pastureland, concentrating on more intensive production on remaining cropland. Farms without cropland well suited to intensive production of better-adapted crops may go out of business. Higher land values support investments in new enterprises through increases in farm equity that support higher levels of debt.

Labor markets act as a two-edged sword in forcing farms to adapt. First, employment opportunities stemming from urban growth may reduce

available skilled, full-time farm labor, such as herdsmen, needed by traditional farm enterprises. Second, more seasonal or part-time help may be available in suburban areas to harvest high-value crops. Part-time picking labor from high school and college students or retired individuals living in suburbia provides farm-labor resources not as readily available in counties outside MSAs. One reason metro farms can adopt high-value crops is because local sources of labor are available at peak periods (Jordan).

Greater off-farm employment opportunities for the farmer or his/her family may help support the farming operation (Stallman and Alwang). Off-farm employment can also provide 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 in urbanizing areas may work part-time on the farm or start recreational farms that eventually develop into full-time, part-time, or retirement businesses.

Growing populations provide opportunities to grow new crops and market them in new ways. Markets for traditional dairy products or field crops may be reduced as milk-collection routes are curtailed and grain elevators go out of business. High-value crops, such as fresh fruits and vegetables, can be sold through restaurants and gourmet grocery outlets or directly to consumers in roadside stands, farmers' markets, or U-pick operations. U-pick farms may combine produce sales with value-added products like dried herbs or flowers, jams and jellies, homemade breads or pastries, or other farm-related products. Recreational aspects of U-pick operations, such as hayrides, picnics, farm-pond fishing, and special holiday features, such as old-fashioned Halloween or Christmas activities, may also add value to urban customers' purchases. Horse boarding, breeding, and training facilities, cattle-breeding operations, or other specialty livestock operations may replace more extensive dairy farms and cow-calf operations.

Suburban neighbors' complaints about farm odors and chemical spraying may force farmers to turn to enterprises that produce fewer negative side effects (Reynolds; Van Driesche et al.). Yet, many suburban residents also support growth controls and farmland-retention programs aimed at preserving the rural landscape to which they were initially attracted (Molnar and Duffy). These programs can provide relief from nuisance actions, while also providing property-tax reductions or financial help for metro farmers.

Farm Types in Metro Areas

Pressures and opportunities for change in metro areas should result in a variety of distinct farm types that exist side by side. Others have developed conceptual or empirical classifications to explain metro farm diversity. Brooks labeled farms with less than \$2,500 in sales "minifarms," while those with \$2,500 to \$20,000 in sales were termed small farms (Brooks). Smith identified "produc-

tion" and "value" types of farming adapted to cities and stressed 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.

On the basis of our conceptual model, we hypothesize the existence of three distinct farm types: recreational, adaptive, and traditional. Metro farm types are expected to range in size from very small (recreational) to nearly as large as nonmetro farms (traditional). Different farm types are expected to use farm resources with different intensities.

Recreational farms are expected to produce very little in sales per acre, using high amounts of labor and capital, but relatively little purchased inputs. Recreational farm owners want to be out of the city for a variety of reasons, including residential amenity, recreation, returning to rural roots, and anticipation of land-value appreciation. Traditional farms are expected to produce more per acre than recreational farms, but less than adaptive farms. They are expected to use large amounts of capital and purchased inputs, but relatively little labor. Adaptive farms are expected to have the highest sales per acre and the highest use of labor, capital, and purchased inputs. While all farms adapt by continuously adjusting their operations, for our purposes the term "adaptive" means changes necessary to compete with other urban land uses. Because adaptive farms are expected to have more intensive operations better adapted to competition in urbanizing areas, they are expected to be more profitable than other metro farms.

Data

The Farm Costs and Returns Survey (FCRS) is an annual survey conducted by the National Agricultural Statistics Service for the Economic Research Service, U.S. Department of Agriculture (Morehart, Johnson, and Banker). FCRS uses farm accounting conventions similar to those used in the National Financial Summary (USDA, ERS). The FCRS provides detailed estimates of the expenses farmers incur operating their farms and other farm characteristics. The 1989 FCRS includes farm operators in the 48 contiguous states who sold or normally would have sold at least \$1,000 worth of agricultural products in 1989. The FCRS surveys approximately 26,000 operators nationally using a list frame of medium to large farms and a complementary area frame to ensure sample representation of smaller farms less likely to appear on lists.

For the Northeast, the 1989 FCRS had 1,078 usable responses, of which 577 were for farms located in the metro counties defined by the Office of Management and Budget and the Bureau of the Census in 1983 (Figure 1).

For purposes of this analysis, farms located in metro counties were classified as recreational, adaptive, or traditional based on the following criteria:

Recreational—farms for which the market value of products sold is less than \$10,000. These farms could also be labeled “residential” and are generally too small to be viable units in commercial markets.

Adaptive—farms selling more than \$10,000, on which sales of high-value products make up more than one-third of all sales or there were more than \$500 of sales per acre of land operated. High-value products include vegetables, fruits and nuts, nursery crops, crops removed under contract, and other livestock, such as horses, bees, fur animals, fish, ducks, and game birds. These farms could also be labeled “intensive,” “high-value,” or “horticultural.” While all farms continuously adapt their operations, “adaptive” in this context refers to changes necessary to compete with other urban land uses.

Traditional—farms with sales over \$10,000 with one-third or less of sales from high-value products and sales per acre of \$500 or less. Farms that met the adaptive farm criteria for sales per acre but which derived more than one-third of sales from conventional livestock enterprises (beef stock, dairy, cattle and calves, hogs, sheep, poultry, and their products) or had sales of conventional crops with high gross receipts per acre (cotton, rice, tobacco, sugar, and peanuts) were also classified as traditional farms. These farms could also be labeled “extensive,” “low-value,” or “other commercial.”

Recreational farms were found to make up 57% of farms in northeastern metro counties, while adaptive farms are 13% of metro farms. Traditional farm types are still an important component in northeastern metros with 30% of farms.

Characteristics of Farm Types in Metro Areas

Consistent with the conceptual model, metropolitan agriculture is not homogeneous. It can be characterized by a leading edge of adaptive farms with

more intensive operations on smaller acreage, a substantial group of traditional farms with extensive operations on large acreage, and a large group of recreational farms that subsidize small-farm activities from nonfarm income. Hypotheses from the conceptual model concerning differences in output and input intensity are largely confirmed. The statistical significance of differences between means of key variables in 15 operational characteristics of recreational and adaptive, and traditional and adaptive metro farms were tested using *t*-statistics. Means of all variables were statistically different between recreational and adaptive farms at the 5% significance level. Means of all but 5 variables were statistically different between traditional and adaptive farms. In the results that follow, the three metro farm types are compared and contrasted with each other and with all nonmetro farms.

Income, Assets, and Returns

Adaptive farm types rely on farm income for more than two-thirds of household income, more than any other northeastern farm type (Table 1). Recreational farms depend on nonfarm income sources, particularly wages and salaries, to subsidize monetary losses in their agricultural activities. Traditional farm types in metro areas depend on nonfarm activities for more than half of their household income, particularly income from off-farm businesses. No information is available from the FCRS sample concerning the kinds of off-farm businesses engaged in by farm operators.

Average product sales of adaptive and traditional farms in metro areas are two to three times higher than average metro farm sales. Low recreational-farm sales reduce the metro average. More adaptive farms have less than \$40,000 in sales (43%) than do traditional farms (36%). On the other hand, 34% of traditional farms have sales over \$100,000, compared with only 30% of adaptive farms.

In general, northeastern farms have smaller receipts from direct government payments than do other farms in the United States because dairy farming, an important enterprise, is supported indirectly through purchases from milk processors. Overall, direct government payments to adaptive northeastern metro farms are equal to the average received by traditional farms. While only 13% of northeastern metro farms receive government payments, 15% of adaptive farms and 25% of traditional farms get payments. Average payments to adaptive farms receiving direct government pay-

Table 1. Income, Assets, and Returns, by Farm Type, Northeast, 1989

Operator Characteristics	Metro Farms ^a			Metro Farms	Nonmetro Farms
	Recreational	Adaptive	Traditional		
<i>Dollars per Farm</i>					
Farm Income					
Sales of agr. products	3,144*	174,651	98,600 +	53,516	59,445
Government payments	126	2,253	2,223	1,025	871
Other farm income	468	3,817	2,742	1,574	3,635
Gross cash farm income	3,738	180,721	103,565	56,115	63,951
Operating expense	8,053*	131,908	83,797 +	46,475	47,598
Net cash farm income	(4,315)*	48,813	19,768 +	9,640	16,353
Net farm income ^b	(189)	53,307	23,647	13,739	19,640
Off-Farm Income					
Wages and salaries	20,496	11,422	10,519	16,351	11,059
Off-farm business	5,276	5,773	10,400	6,878	7,410
Interest/dividends	3,891	4,351	4,261	4,061	2,202
Other off-farm income	5,052	2,219	1,429	3,605	3,910
Total off-farm income	34,807*	23,905	26,792	31,020	24,608
Household income	30,492*	72,718	46,560 +	40,661	40,961
Return on assets ^c	(5,174)*	31,876	11,420	4,498	9,147
Return on equity ^d	(6,333)*	24,317	5,425	1,077	5,820
Assets	453,865*	1,071,670	671,823 +	597,502	354,196
Debt	14,218*	96,551	59,623 +	38,272	38,364
Net worth	439,647	975,119	612,200	559,230	315,832
<i>Percent of Capital</i>					
Returns ^e					
To assets	(1.1)	3.0	1.7	0.8	2.6
To equity	(1.4)	2.5	0.9	0.2	1.8

Source: 1989 Farm Costs and Returns Survey.

^aDifferences between means of recreational and adaptive (*), and traditional and adaptive (+) are significant at the 5% level.

^bNet cash farm income (or loss) plus imputed rental value of the farm residence.

^cNet cash farm income (or loss) less imputed charges to operator labor, management, and unpaid labor, plus interest. Does not include imputed rental value of the farm residence.

^dReturn on assets less interest.

^eReturn on assets as a percent of assets, and return on equity as a percent of net worth.

ments are \$14,712 per farm, 65% higher than the \$8,894 received by participating traditional farms. Adaptive farms receiving government payments, like other northeastern adaptive farms, rely on vegetables and fruit for most (56%) of their total sales. However, they also produce tobacco (17%); field crops, including corn and soybeans (9%); and other crops (8%) for which government payments are available. Traditional farms have sales of these crops as well but have tobacco sales only 1% as large as adaptive farms.

Average net cash farm income earned by adaptive farms is more than twice as large as that for traditional metro farms. The gap between metro and nonmetro net farm income (including the imputed rental value of farm residences) narrows since farm residences in metro areas are more expensive than those in nonmetro areas. The average value of dwellings reported by operators in metro areas is \$71,200, versus \$50,900 in nonmetro areas. The imputed gross rental value of operator dwellings offsets some of the losses on farming operations for recreational farms in metro areas

and may be one of the principal economic motivations for recreational farm enterprises. Capital gains from subdivision opportunities and opportunities to shelter off-farm income from taxes may also motivate recreational farmers. While recreational farm decision making may be rational, it does not appear to be primarily oriented toward market transactions in agricultural products.

Average farm assets in metro areas are more than half again as large as nonmetro farm assets, reflecting higher land values nearer urban centers. Assets of adaptive farms in metro areas are 60% larger than those of the average traditional metro farm. Recreational farm assets are 76% of metro farm assets, but they support sales only 6% as large as the average metro farm. Debt of the average farm in metro areas is equal to that of nonmetro farms but is smaller in relation to larger assets.

Returns to assets and equity from current income for adaptive farms are three to five times greater than for traditional farms in metro areas on higher assets. These returns do not include possi-

ble long-term capital gains from the eventual sale of real estate. As a percent of assets and equity, adaptive farm returns on current income outpace all other metro farm types.

Farm Enterprises

In general, farms in metro areas take advantage of their proximity to consumer markets by specializing in farm products that have high value per acre, are relatively perishable, and are more difficult to store and transport (Table 2). While adaptive farms are defined in terms of high-value crop production, the concentration of sales in the high-value category (86%) is remarkable. Nursery and greenhouse products are the largest component of high-value product sales. Livestock accounts for almost no sales on adaptive farms in metro areas.

Seventy percent of traditional farm sales in northeastern metro areas are from milk and dairy products. Dairy farming has historically located near cities because of perishability and transportation. Northeastern nonmetro counties are still relatively near urban centers compared with non-metro counties in most other regions, so dairy is an important enterprise on these farms, as well, but only accounts for half of all sales. Recreational

farm types have sales from cash crops, calves and other cattle, and other livestock enterprises that require less labor on a day-to-day basis than does dairy farming.

Production Expenses

The composition of operating expenses differs between farm types in metro areas because of differences in the kind of enterprises pursued (Table 3). The principal expenses on recreational farms are operator labor, taxes (including higher property taxes), interest, and repair and maintenance expenses for land improvements. These expenses reflect the noncommercial character of such farms and show that much of the expense relates to obtaining and maintaining the farm, rather than operating it as a productive unit.

Adaptive farms in metro areas, many of which are engaged in high-value horticultural and nursery production, spend relatively more on seeds and plant stock, on agricultural chemicals, and on hired and contract labor for care and harvest. Containers needed to sell these products are also a large expense category for adaptive farms.

Contrary to expectations, traditional farms spend about the same proportion of total expenses

Table 2. Farm Sales by Commodity, by Farm Type, Northeast, 1989

Operator Characteristics	Metro Farms			Metro Farms	Nonmetro Farms
	Recreational	Adaptive	Traditional		
<i>Percent of Sales^a</i>					
Crops					
Corn	10	1	5	4	2
Soybeans	3	0	2	2	2
Wheat	2	0	1	1	1
Other crops ^b	<u>18</u>	<u>11</u>	<u>1</u>	<u>6</u>	<u>12</u>
Field crops	34	13	10	12	6
Vegetables	2	12	1	5	6
Fruits and nuts	9	23	0	9	3
Nursery/greenhouse	4	44	0	18	12
Contract crops	<u>0</u>	<u>8</u>	<u>0</u>	<u>4</u>	<u>3</u>
High-value crops	14	86	1	36	24
Total crops	48	99	11	47	30
Livestock					
Breeding stock ^c	12	0	3	2	2
Calves and cattle	20	0	9	6	8
Hogs, sheep, poultry	10	0	2	2	6
Contract livestock	2	0	5	3	3
Other livestock	<u>7</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>
Livestock	51	1	19	13	21
Milk/dairy products	1	0	70	40	49
Total livestock	52	1	89	53	70
Total sales	100	100	100	100	100

Source: 1989 Farm Costs and Returns Survey.

^aDoes not include government payments associated with crop production.

^bIncludes barley, oats, rye, peas, sorghum, dry beans, tobacco, potatoes, hay, seeds, popcorn, and other crops not enumerated.

^cIncludes sales of beef and dairy cows, bulls and replacement heifers, and sows, boars, and replacement gilts.

Table 3. Farm Expenses, by Farm Type, Northeast, 1989

Expense Category ^a	Metro Farms ^b			Metro Farms	Nonmetro Farms
	Recreational	Adaptive	Traditional		
Total operating ^c	15,122*	157,485	<i>Dollars per Farm</i> 109,691 +	61,540	63,486
	<i>Percent of Operating Expenses</i>				
Seeds and plants	1	6	2	3	3
Agr. chemicals	3	9	6	7	5
Containers and other	1	7	4	5	4
Subtotal plant	5*	22	12 +	15	12
Purchased feed ^d	6	1	22	12	19
Purchased livestock	4	0	6	4	4
Vet. services/supplies	1	0	3	2	2
Subtotal livestock	11	1	31	18	25
Custom and leasing	1	1	1	1	1
Fuel and oil	2	4	3	3	3
Repairs	3	4	5	4	5
Subtotal machinery	6	9	9	8	9
Operator/unpaid labor	35	13	16	18	19
Hired labor ^e	2	31	6	13	10
Subtotal labor	37*	44	22 +	31	29
Utility and business	3	7	3	4	4
Insurance	3	2	2	2	2
Total tax	10	3	3	4	3
Subtotal business	16	12	8	10	9
Interest	7	5	5	5	6
Cash rent	0	2	3	2	2
Repairs & maintenance	5	2	2	2	2
Subtotal land	12	9	10	9	10
Total operating	100	100	100	100	100

Source: 1989 Farm Costs and Returns Survey.

^aDetail does not add to total.

^bDifferences between means of recreational and adaptive (*), and traditional and adaptive (+) are significant at the 5% level.

^cTotal expenses, including cash expenses, depreciation, and operator and unpaid labor.

^dIncludes custom feeding.

^eIncludes cash fringe benefits.

on machinery costs as adaptive farms. Traditional farms' greater livestock expenditures, particularly for purchased feeds, offset lower expenses for seeds and agricultural chemicals, resulting in larger purchased input expenditures than for adaptive farms.

Land Use and Value

Farmers in metro areas operate fewer acres than nonmetro farmers (Table 4). Recreational farms are less than half the size of the metro average size, while traditional metro farms operate the largest farms in metro areas. On average, traditional metro farms rent more land than do adaptive metro farms. Adaptive metro farms own more of the land they operate (76%). Recreational farms own nearly all of the land they operate.

Farmland in northeastern metro areas is nearly three times more valuable than nonmetro farmland. Moreover, land on adaptive metro farms is

more than twice as valuable as traditional metro farmland. Differences in average land value by farm type may reflect differences in land quality for agricultural production. A larger proportion of adaptive farmland is planted to crops and is thus likely to be of higher quality than the mix of cropland, pasture, and woodland more typical of traditional farms. The higher value per acre on adaptive farms may also reflect locations nearer to urban development within metro areas.

Rental payments reflect the differences in value between metro and nonmetro areas and between metro farm types, but are less than proportional to land-value differences. Rents in metro areas are less than twice as large as rents in nonmetro areas, while values are three times larger. There are interesting differences between rents for land rented in and out, by metro farm type. Adaptive farms pay the most for land rented in. Recreational metro farms get the least for land rented out to others. Conversely, traditional metro farms pay the least

Table 4. Land Ownership, Operation, and Intensity, by Farm Type, Northeast, 1989

Operator Characteristics	Metro Farms ^a			Metro Farms	Nonmetro Farms
	Recreational	Adaptive	Traditional		
<i>Acres per Farm</i>					
Acres owned	57	124	145	92	144
Cash rented in	6	35	109	41	42
Share rented in	0	0	6	2	5
Used free of charge	4	11	12	7	14
Total rented in	10	46	127	50	61
Cash rented out	4	8	2	4	7
Acres operated	63*	162	270 +	138	198
<i>Dollars per Acre</i>					
Value of land owned	6,765	7,154	3,141	5,111	1,740
Annual cash rental in	11	78	32	35	25
Annual cash rental out	46	63	73	54	29
Sales of agr. products	50	1,083	367	391	314
Return on equity ^b	(101)	150	20	8	30
Capitalized @ 5%	(2,020)	3,000	400	156	593
Purchased inputs	25	239	73	85	55
Labor input	118	469	124	174	140
Operating expenses	241	972	404	446	323
Input/output ratio	.21	1.11	.91	.88	.97
Capital assets	593	1,130	600	677	427
Total assets	7,234	6,612	2,475	4,329	1,805
Debt	227	596	220	277	196

Source: 1989 Farm Costs and Returns Survey.

^aDifferences between means of recreational and adaptive (*), and traditional and adaptive (+) are significant at the 5% level.

^bNet cash farm income (or loss) less imputed rental value of the farm residence.

for land rented in and get the most for land rented out. It may be that adaptive farms rent better quality land, particularly in light of their intensive production.

Productive Intensity

Traditional farms within northeastern metros have slightly lower sales per acre than the metro average (Table 4). Adaptive farms sell nearly three times as much per acre as the metro average. Recreational farms sell only \$50 per acre operated.

Adaptive farm returns per acre are 7.5 times that of traditional metro farms. Traditional farms in northeastern metros have higher costs per acre than their nonmetro counterparts, but without the higher receipts from higher-value enterprises. The better-adapted farms are more profitable.

Capitalizing returns to equity provides an estimate of the agricultural use value of land operated by the various farm types. Farms in nonmetro areas produce agricultural value equal to about one-third of the value of their land. Traditional metro farms account for only 13% of the land's value in agricultural production, while more intensive production of higher-value products on adaptive farms equals 42% of the higher land value.

The value of inputs used per acre is a measure of land-use intensity. Recreational farms use the fewest purchased inputs and have lowest total operating expenses per acre of all metro farm types. Traditional farms have only marginally higher purchased input, labor use, and operating expenses per acre than the average nonmetro farm. Adaptive metro farms use 2.8 times as much purchased inputs and 2.7 times as much labor per acre as the average metro farm, reflecting much higher land-use intensity.

Dividing operating expenses per acre into sales per acre yields an input/output ratio that is an overall measure of productive intensity. Adaptive metro farm intensity is the highest of all farm types examined here, with adaptive metro farms selling \$1.11 for each dollar of input expense. Traditional farms have a lower ratio, recovering only 91 cents on each dollar of inputs. Recreational farms have very little market output per dollar of expense on each acre.

Total assets per acre and debt per acre measure investment in the farm operation and the extent to which operators are leveraged. Northeastern farms have two to three times as much investment per acre as farms in other parts of the United States, partly due to greater investments in livestock herds

and expensive dairy facilities. Farms in northeastern metro areas have more than twice as much investment as nonmetro farms and lower debt.

Recreational metro farms have the largest investment per acre because of their smaller acreage and the noncommercial nature of their investment. However, land makes up a larger proportion of total investment than for other farm types. Adaptive metro farms have investment and debt per acre almost three times higher than traditional metro farms. Contrary to expectations, investment in capital assets per acre on adaptive farms is nearly twice that on traditional farms.

Relative Importance of Northeastern Farm Types

The official Metropolitan Statistical Area (MSA) definition used here is a proxy for areas influenced by urbanization, although not completely dominated by urban land uses. Farms outside defined MSAs experience some of the urban pressures and have some of the same opportunities as farms inside metro areas.

Because urban development is so pervasive in the Northeast, distinctions between farms in metro and nonmetro areas are not as sharp as in other regions. Consequently, 12% of nonmetro farms meet the adaptive farm definition and 50% are classified as recreational—much higher proportions than in other regions. The nearly equal percentages of adaptive farms in northeastern metro and nonmetro areas say less about the process of adaptation than they do about the appropriateness

of the metropolitan concept in the region. Overall for the United States, adaptive farms are 11% of all farms in metro counties and only 6% of nonmetro farms. In other words, there is much less difference between metro and nonmetro urban pressures in the Northeast than there is for the United States.

While the characteristics of farm types in metro areas are the focus of this paper, the adaptations to urbanization causing farm differentiation are also taking place in northeastern nonmetro counties. However, nonmetro adaptive farms average only \$651 in sales per acre, compared to \$1,083 per acre on adaptive farms in metro areas. Intensification of production on nonmetro adaptive farms has not been taken as far as in metro areas.

The relative importance of the three farm types discussed here for agriculture in urbanizing areas depends on what aspects are deemed important determinants of farming's future. Different conclusions result if farm numbers, farmland acreage, sales of agricultural products, or returns on agricultural assets from current income are considered (Table 5).

By any measure, traditional farms are still an important component of agriculture in metro areas of the Northeast. While traditional farms make up only 30% of farms in metro areas, they control half of metro farmland. However, traditional farming may not generate sales and income high enough to offset higher land values and operating expenses in urbanizing areas. While traditional farms earn 58% of metro farm net income, they account for only 35% to 46% of positive returns on assets and equity from current income.

Recreational farms make up nearly 60% of

Table 5. Spatial and Economic Importance of Farm Types, Northeast Metro Areas, 1989

Characteristic	Farm Type			Total
	Recreational	Adaptive	Traditional	
Number	57	13	30	100
Farmland		<i>Percent of Metro Total</i>		
Operated	26	15	59	100
Owned	35	17	47	100
Planted	15	17	68	100
Value of sales	3	41	55	100
Net cash farm income	-26	64	62	100
Net farm income ^a	3	39	58	100
Assets ^a	44	23	33	100
Net worth ^b	45	22	33	100
Returns to assets	*	54	46	100
Returns to equity	*	65	35	100

Source: 1989 Farm Costs and Returns Survey.

^aIncludes gross imputed rental value of the farm residence.

^bAssets less debt.

*Negative returns; percent of positive returns calculated for adaptive and traditional farms.

farms in metro areas, and control over 40% of assets and equity attributed to the farm sector, and 35% of metro farmland. However, recreational farms plant only 15% of metro farmland and have no viability as business enterprises. Recreational farming may represent one way to preserve rural land and some degree of visual rural presence in an increasingly urban landscape, but it is essentially a consumption activity that will become increasingly expensive for its owners to maintain as urban development continues.

Adaptive farms mirror aspects of both traditional and recreational farms. They account for only 13% of farm numbers and control only 17% of farmland, but have disproportionate economic importance. Adaptive farms have about 41% of sales in metro areas and 39% of net farm income. They account for more than half of positive returns on assets invested in agriculture and almost two-thirds of returns on equity. While adaptive farms are a small part of metro agriculture today, they are likely to survive and increase because they can better compete economically with urban land uses.

Conclusions and Implications

Our conceptual model indicated differentiation among farm types under the influence of urbanization and suggested likely characteristics of each farm type. The FCRS data for 1989 confirm that farms classified as recreational, adaptive, and traditional have different characteristics conforming to our expectations. Recognition of differences between these groups of farms in metro areas and knowledge of their characteristics can assist agricultural researchers, extension agents, and policy makers that deal with agriculture near cities.

Adaptive farms, defined on the basis of enterprises pursued and productive intensity, are clearly distinguishable from recreational and traditional farm types. Adaptive farms are more successful than traditional farms in metro areas, producing more than twice as much net cash income per farm with higher current returns on investment on farms that have half the acreage. Adaptive farms are defined by a high value of sales per acre, but they are also operated much more intensively, with two to three times higher input and labor use and almost eight times the return per acre as traditional metro farms. Investment in adaptive metro farms is three times greater than for traditional farms and investment is more than twice as high per acre. The higher sales and returns of adaptive farms more nearly justify land values that are twice as high as on traditional metro farms and reduce the oppor-

tunity cost of farming relative to selling out for urban development.

The future of agriculture in urbanizing areas will depend on competitive forces, market opportunities, and public policies. Unrestricted competition for land will likely result in the decline of traditional farms. Adaptive agriculture's ability to replace traditional farms will depend on farm operators' creativity in developing new "niche" market opportunities and increasing the volume of sales and the return on each acre they farm. However, much of the land currently farmed in metro areas may not be suited for this kind of intensive agriculture.

Some will see little benefit in retaining a place for agriculture in the metro economy by sacrificing most of the agricultural land and all of the visual amenity and rural lifestyle associated with traditional farming. Farmland-retention programs and growth-control programs have a role to play in mitigating economic competition for land to achieve public goals for balanced land use and open space. Such programs can preserve all farm types in metro areas, making recreational farming less expensive, sheltering traditional farms from economic competition, and easing the transition to adaptive agriculture. The extent to which such programs are directed toward saving farmland, saving farming, or attempting to do both can have an impact on whether metro agriculture is primarily a hobby, a museum piece, or a business.

References

- Ahearn, M., and D. Banker. "Urban Farming Has Financial Advantages." *Rural Development Perspectives* (October 1988):119-21.
- Brooks, N.L. "Minifarms: Farm Business or Rural Residence?" AIB-480. U.S. Dept. of Agriculture, Economic Research Service. Washington, DC, February 1985.
- Heimlich, R.E. "Metropolitan Agriculture in the Northeast: New Settlement Patterns and Agricultural Adaptation." Selected paper presented at the Northeastern Agricultural and Resource Economics Association meeting, Kingston, RI, 22-24 June 1987.
- Heimlich, R.E. "Metropolitan Growth and High-Value Crop Production." In *Vegetables and Specialties Situation and Outlook Report*, 17-26. TVS-244. U.S. Dept. of Agriculture, Economic Research Service. Washington, DC, February 1988.
- Heimlich, R.E., and C.H. Barnard. "Agricultural Adaptation to Urbanization: Farm Types in U.S. Metropolitan Areas." In *Rural Planning and Development: Visions of the 21st Century*, edited by I. Audirac and E.M. Starnes, 551-62. Gainesville, FL: University of Florida, 1991.
- Heimlich, R.E., and D.H. Brooks. "Metropolitan Growth and Agriculture: Farming in the City's Shadow." AER-619.

- U.S. Dept. of Agriculture, Economic Research Service. Washington, DC, September 1989.
- Jordan, C. "The Pendletons of Kansas: Doing Better with Asparagus and Tomatoes." In *Farm Management: How to Achieve Your Farm Business Goals. 1989 Yearbook of Agriculture*. U.S. Dept. of Agriculture.
- Molnar, J.J., and P.A. Duffy. "Urban and Suburban Residents' Perceptions of Farmers and Agriculture." In *Sustaining Agriculture Near Cities*, edited by W.H. Lockeretz, 121-34. Ankeny, IA: Soil and Water Conservation Society, 1987.
- Morehart, M.J., J.D. Johnson, and D.E. Banker. "Farm Businesses End the Decade With Strong Financial Performances." AIB-616. U.S. Dept. of Agriculture, Economic Research Service. Washington, DC, October 1990.
- Reynolds, M.L.R. "Urban Sprawl as it Affects the Southern California Poultry Industry." In *Sustaining Agriculture Near Cities*, edited by W.H. Lockeretz, 63-76. Ankeny, IA: Soil and Water Conservation Society, 1987.
- Smith, S. "Farming Near Cities in a Bimodal Agriculture." In *Sustaining Agriculture Near Cities*, edited by W.H. Lockeretz, 77-90. Ankeny, IA: Soil and Water Conservation Society, 1987.
- Stallman, J.I., and J. Alwang. "Local Labor Markets and Part-time Farming in Virginia." In *Rural Planning and Development: Visions of the 21st Century*, edited by I. Audirac and E.M. Starnes, 357-65. Gainesville, FL: University of Florida, 1991.
- U.S. Bureau of the Census. *State and Metropolitan Area Data Book, 1986*. Washington, DC, April 1986.
- U.S. Department of Agriculture. Economic Research Service. *Economic Indicators of the Farm Sector: National Financial Summary, 1989*. ECIFS 9-2. Washington, DC, January 1991.
- Van Driesche, R.G., J. Carlson, D.N. Ferro, and J.M. Clark. "Pesticides and Suburban Agriculture." In *Sustaining Agriculture Near Cities*, edited by W.H. Lockeretz, 47-62. Ankeny, IA: Soil and Water Conservation Society, 1987.