Agriculture's Hold on the Commonwealth

David Holm, Daniel Lass,
Richard Rogers, and David Damery

Department of Resource Economics, University of Massachusetts Amherst

DAVID HOLM is a Ph.D. candidate in plant and soil sciences at the University of Massachusetts in Amherst.

DANIEL LASS is a professor of resource economics at the University of Massachusetts in Amherst.

RICHARD ROGERS is a professor of resource economics at the University of Massachusetts in Amherst.

DAVID DAMERY is a lecturer in natural resources conservation and a Ph.D. candidate in resource economics at the University of Massachusetts in Amherst.

This study was funded by the Massachusetts Department of Food and Agriculture and the University of Massachusetts.

CONTENTS

FIGURES, TABLES, AND MAPS:

INTRODUCTION

Farming And Forestry: One Industry, Two Sectors

This look at the agriculture industry includes the activities of the economy's farming and forestry sectors. In contrast to its image nationally, the commonwealth's agriculture industry appears to be quite healthy. Sales are up in the farming sector, and the balance sheets of the state's farmers are sound overall. Significant changes in the product mix have been reinforced by considerable geographic diversity. Other important changes include a trend toward smaller farms and an increase in the number of farms across the state. At the same time, the commonwealth's forest resource is growing, and the forestry sector is poised to gain from increased global demand for its products.

The farming sector is tracked by the United States Census of Agriculture, which collects and reports local, state, and national data at five-year intervals. Forestry is monitored through the USDA Forest Service's periodic inventories of forest health across the nation. For the purposes of understanding both of these elements of our agricultural base, this study discusses farming and forestry separately.

In both segments of the agriculture industry, future success lies with the ability to adapt to an evolving market. This report provides information about the current trends that are part of this important evolution.

The State of Farming in the Commonwealth

The commonwealth's agriculture industry has long been viewed as paramount to the state's economy. Ever since Colonial times, Massachusetts has held fast to its cherished legacy as an important agricultural state. This traditional image has paled in the minds of many, with ever-increasing industrial and residential development.

A proportional decrease in agricultural production is reflected in the industry's relatively low position in the state's economic hierarchy. In 1998, agriculture employment was recorded at 21,583, less than 1 percent of the state's total employment. This figure belies the stable presence of the industry, however, as many Massachusetts farmers now hold full-time, non-farm jobs while continuing to work their farms on the side. Most significantly, the status and prospects of agriculture are considered more important in scope far beyond its portrayal in the economic data.

Census of Agriculture Provides Pictures of the Industry at Regular Intervals

For more than 150 years, farmers, scientists, businesspeople, and public and private agricultural agency workers have used the Census of Agriculture to chart the nation's agricultural economy. Conducted at five-year intervals since 1920, the census serves as a blueprint of changes in the industry across the United States. It provides insights into agricultural patterns influencing the country, individual states, and counties within each state. In contrast to sample data, a census strives to measure and represent all farms. Census data, not subject to sampling error, are reliable at a highly detailed level. They are also accurate on a variety of dimensions, such as crop type, geographic region, farm size, and the demographics of the farming population.

What do current census data tell us about the agriculture economy in Massachusetts? Is it vibrant or is it stagnant? Which enterprises are growing and which are shrinking? Are there "old standby" sectors that remain stable in the agricultural economy? Are some sectors dying out? Data from the 1997 census provide a mixed picture.

While the commonwealth has lost nearly 85,000 acres of farmland during the past quarter century, the number of farms has increased. Our farms appear to be quite healthy, in contrast to farms nationally. Farmers seem to have discovered ways to make their farms more viable, getting the most from each acre. Census data also reveal that there is a significant variety of farming activity across regions in the state.

Recent Developments Improve the Outlook

In recent years, Massachusetts farmers have responded to changes in prices and costs by altering their mix of crops and production methods. This has resulted in an increase in crop production and a decline in livestock production. Since 1978, the greatest value increases occurred in these broadly defined commodity groups: fruits, nuts and berries; tobacco; nursery and greenhouse crops; and vegetables, sweet corn, and melons.

Overall, the census shows that in 1997 the Massachusetts agriculture economy was the strongest it had ever been. Since 1974, agricultural product sales have increased in both nominal and real terms,[1] reaching an all-time high of $454 million (nominal value) in 1997. The numbers present a hopeful picture, indicating that farmers have improved production, marketing, and financial management.

Figure 1 (Value of Farm Production)

An indicator of profitability for the Massachusetts farm economy is net farm income: returns to the farm operator after paying expenses. Total net farm income declined until the 1970s, and then reversed its trend. [2] In 1974, net cash returns per farm were $5,448. By 1997, this number had climbed to a record high, making Massachusetts 14th of all states in net farm income per farm operation and fourth in net farm income per acre.

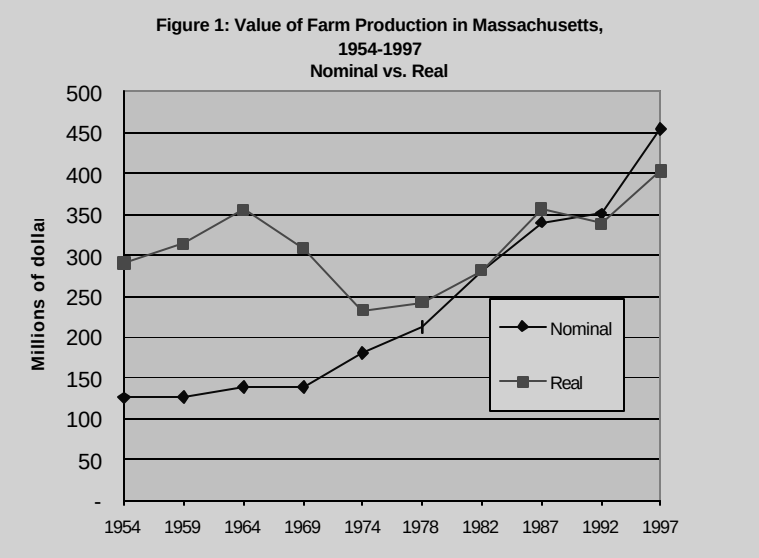
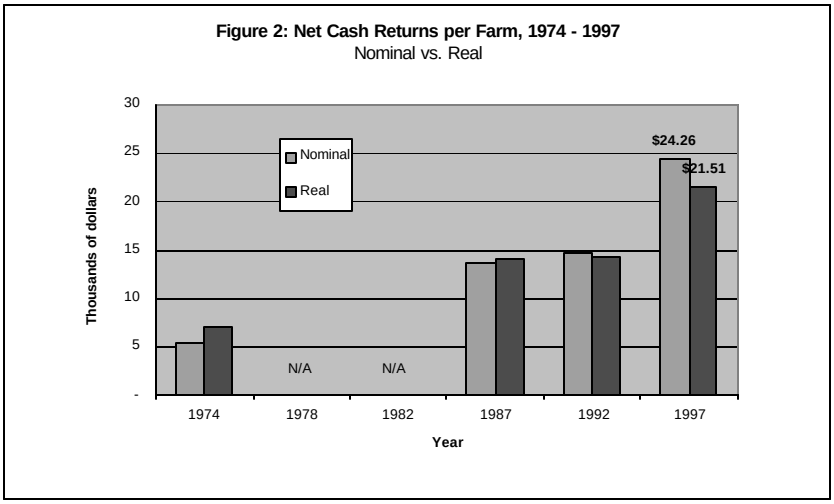


Figure 2: Net Cash Returns



Land Value, Irrigation, and Marketing Numbers Are Also Impressive

A look at the agriculture sector's balance sheet shows that the conservative strategy of Massachusetts farmers has provided financial stability and enhanced survival. Debt-to-asset ratios on Massachusetts farms averaged 12 percent from 1960 to 1997 and only 9.2 percent from 1987 through 1997. U.S. averages were 17 percent and 16.3 percent, respectively.

Rates of return in the agriculture sector have been consistently low. Nationally, the rate of return on assets from current farm income averaged 3.2 percent from 1960 to 1997. In Massachusetts, the average was only 1.3 percent. When considering their total rate of return on assets, however, farmers also include increasing property values, as measured in real capital gains. The rate of return on assets from real capital gains during this period was 3.7 percent for Massachusetts farmers, much better than the national average of 1 percent over the same period. Combining these two rates of return (returns on assets from farm income and real capital gains), the average Massachusetts farmer had a total rate of return of about 5 percent, as compared to just over 4 percent for the average U.S. farmer.

Massachusetts farmers also improved profitability by installing irrigation systems to counter the effects of drought and to enable more intensive production of higher-value

crops. The number of farms with irrigation increased from 879 in 1974 to 1630 in 1997. Twenty-nine percent of farms had irrigation capable of watering a total of 24,564 acres in 1997, an increase of nearly 33 percent over the 18,512 acres irrigated in 1974. The percentage of farms with irrigation in Massachusetts was higher than that of any other New England state.

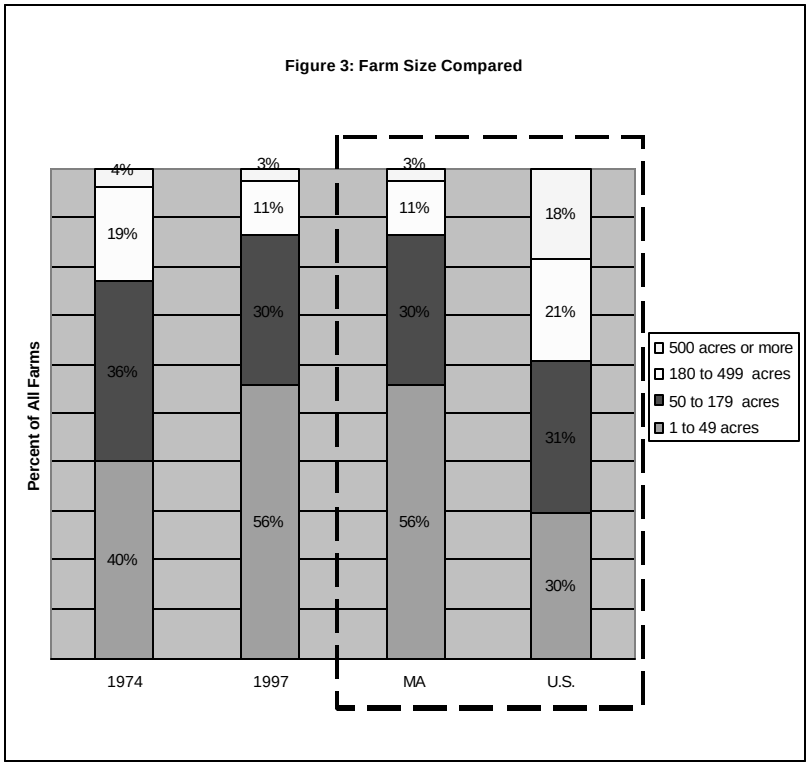
Roadside stands, farmers' markets, pick-your-own crops, and subscription farms (also known as community supported agriculture) played a major role in increasing agriculture's profitability. Direct marketing sales in Massachusetts grew from $9.6 million in 1978 to $20 million in 1997, leading all states with a per-farm average of $3,557. The average direct-marketing sales for farms that practiced direct sales were $16,170 in 1997, an increase of 79 percent over 1978. Massachusetts ranked second nationally in direct sales in 1997; Rhode Island ranked first. Worcester County ranked an impressive second of all the nation's counties for total direct-market dollars. Twenty-one percent of Worcester County's farms used direct-market outlets and earned $21,775 per farm on average in 1997, a 50 percent increase over 1978.

Farm Size Drops, but Number Grows

The number of farms in Massachusetts decreased dramatically from 37,007 in 1945 to a low of 4,497 in 1974. While farm numbers continued to decline nationally, the Massachusetts trend reversed, with numbers increasing by 24 percent from 1974 to 1997. In 1997 there were 5,574 farms in Massachusetts.

In the Midwest, farmland has been consolidated into fewer, larger farms. In contrast, an increasing percentage of the commonwealth's new farms are small farms. In 1974, 59 percent of Massachusetts farms were 50 acres or larger. In 1997, only 44 percent were 50 acres or larger. Fourteen percent of farms were smaller than 10 acres in 1974, as compared to 22 percent in 1997.

Figure 3: Farm Size Compared



Average U.S. farm size peaked in the 1992 census year at 491 acres per farm; it remained relatively unchanged at 487 acres in 1997. Total Massachusetts farm acreage declined by 14 percent from 601,734 acres in 1974 to 518,299 acres in 1997. The state's cropland (the most productive farmland) declined by a similar percentage, from 257,033 acres in 1974 to 223,573 acres in 1997. The decline in farm acreage, coupled with an increased number of farms, resulted in a smaller average farm size. The average size of farms in the state fell 31 percent,

from 134 acres in 1974 to 93 acres in 1997.

Massachusetts can be characterized as a "small-farms state," not only by acreage but by sales, as well. Since 1974, about 30 percent of farms had sales under $2,500 per year, and about 55 percent had sales under $10,000. There were increased numbers of farms with sales under $10,000, as well as increased numbers with sales over $100,000. Numbers of farms with sales between these levels have remained relatively constant.

Eighty percent of Massachusetts farms operated as sole proprietorships, and another 8 percent were managed as private partnerships. Only 10 percent were operated as corporations; of these, nine out of 10 were family-held corporations with 10 or fewer stockholders. Fewer than 2 percent of farms were held by other business structures, such as cooperatives, estates or trusts, or institutions. These statistics have changed little since 1978, when 83 percent of farms were sole proprietorships, 9 percent were private partnerships, 7 percent were corporations, and 1 percent were owned by other business structures.

Farmer Demographics Change as Well

In addition to changes in farm size, sales and crop mix, there were changes in the demographics of the farmers themselves. In 1997, the commonwealth's farming population consisted of a higher percentage of part-time farmers than it had in previous years. The percentage of farm operators for whom farming was not a primary occupation increased from 39 percent in 1974 to 47 percent in 1997. The strong Massachusetts economy makes this diversification possible.

The farm population is aging, and fewer young people are entering the field. In 1997, the average age of farmers in Massachusetts—55 years old—was at an all-time high. Only 5 percent of farmers were under the age of 35, as compared to 11 percent in 1978; 47 percent were over the age of 55, as compared to 45 percent in 1978. This phenomenon could present a surge of future retirements and subsequent farm losses, unless new farmers are attracted to farming and find it a viable occupation.

The number of farms and total acreage managed by female farm operators has been increasing. In 1978, there were 453 women farmers managing 35,098 acres. By 1997 that number had more than doubled; there were 926 women managing 47,374 acres. In Massachusetts, in contrast with other states, the number of farms operated by minorities has remained small and did not increase significantly in 20 years. In 1997, 36 farms comprising 1,309 acres were operated by non-white minorities, while in 1978, 33 minority-operated farms comprised 1,950 acres.

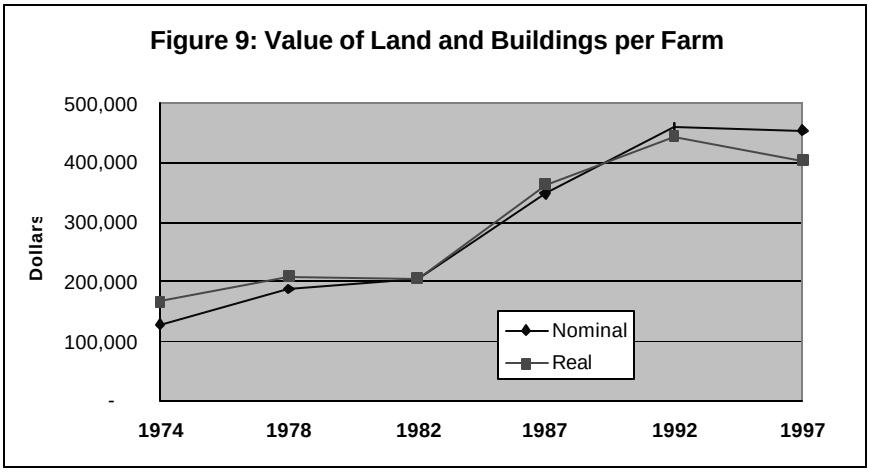
Farming's Future Shows Promise

The goal of increased profitability and the pro-active strategies needed to reach it will become especially important for farmers in the coming years. Massachusetts presents its farmers with distinct challenges. There are concerns about who will replace retired farmers, if financial incentives are inadequate. There is a constant temptation to sell farmland to developers when farm profits cannot compete with land prices.

An obstacle for new farmers is that investment costs are onerously high. The estimated market value of all farmland and buildings averaged $5,207 per acre in Massachusetts in 1997, with an average investment per farm of $455,014. This is a dramatic increase from

1974, when average value was $961 per acre and $128,535 per farm. The average investment in machinery and equipment was $40,395 per farm in 1997, up from $19,729 in 1974.

Figure 9: Value of Land and Buildings



Farming is also labor-intensive. Massachusetts farms paid $82 million for hired labor on $455 million in sales in 1997. This 18 percent of gross paid for hired labor did not change from 1974, when $32 million in labor achieved $180 million in sales. These figures do not include the value of the operator's labor or unpaid family labor. The new generation of farmers must be able to justify high financial investment with the promise of reasonable financial returns. More than ever, Massachusetts farmers must hone their business management skills to remain competitive.

While it is true that the loss of farmland in Massachusetts is problematic, and there are concerns about the lack of new entry-level farmers, it should not be assumed that agriculture in the state is declining. Data from the 1997 census show that the Massachusetts agricultural economy has made a remarkable recovery and promises to continue its significant contribution to the state's economy. Changing practices will give the commonwealth's farmers an opportunity to prosper in the twenty-first century.

Regional Strengths Vary

In 1997, the top five categories of Massachusetts agricultural production were (1) fruits, nuts and berries, (2) nursery and greenhouse products, (3) dairy products, (4) vegetables, sweet corn, and melons, and (5) tobacco. There are clear differences in agricultural production from region to region.

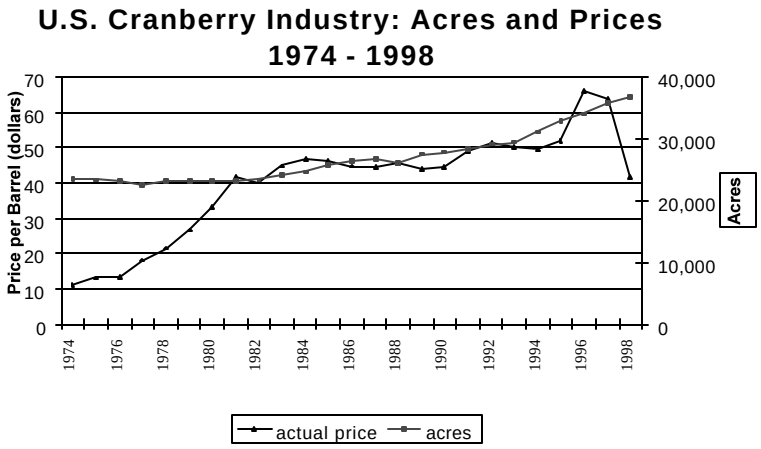
Cranberry production dominates agriculture on Cape Cod and in Plymouth County. Generally, farms in the Greater Boston region have survived in an urban environment by taking advantage of consumer markets, especially for nursery and greenhouse products and vegetable crops. Moving to the south and west, we see a transition to more traditional agriculture, as vegetable production and dairy farms become most prevalent.

Cranberry Industry Suffers Falling Prices

Massachusetts is no longer the cranberry capital of the world, but that is not the worst of the news. The industry has slid into the down side of a boom-and-bust cycle, and the Commonwealth may be hardest hit. After years of successful product development and marketing by Ocean Spray, the industry enjoyed a seemingly insatiable thirst for cranberry juice and prices climbed steadily. It emerged from a 1970s lull to sales so strong that other states got serious about production and began scooping up shares of the market.

From 1981 to 1998, U.S. cranberry acreage jumped nearly 60 percent, adding 13,450 new acres. Most of this was from Wisconsin growers, who amplified their presence with modern

bogs and new high-yielding hybrids, helping the state replace Massachusetts as the world's top cranberry producer. Michigan, Maine, even parts of the Northwest and Canada expanded their crops as well. Massachusetts, with limited land and high real-estate costs, had little room to grow.



As inventories began to build in the mid-1990s, prices fell from a record high of $65.90 per barrel in 1996 to $41.60 in 1998. The 1998 price was less than most growers' costs of production. In 1999, the price paid to Massachusetts cranberry growers fell to $16 per barrel. While these reduced prices will curtail expansion, increased yields will continue to generate large supplies. The industry is faced with matching supply and demand while providing acceptable prices to growers.

The USDA has promised nearly $600,000 for export promotion and has included cranberries in the government's commodity purchase program. The Cranberry Marketing Board is exploring options for stabilizing prices in the short term. The lean years seem to be upon us, however, and the industry must find ways to cope.

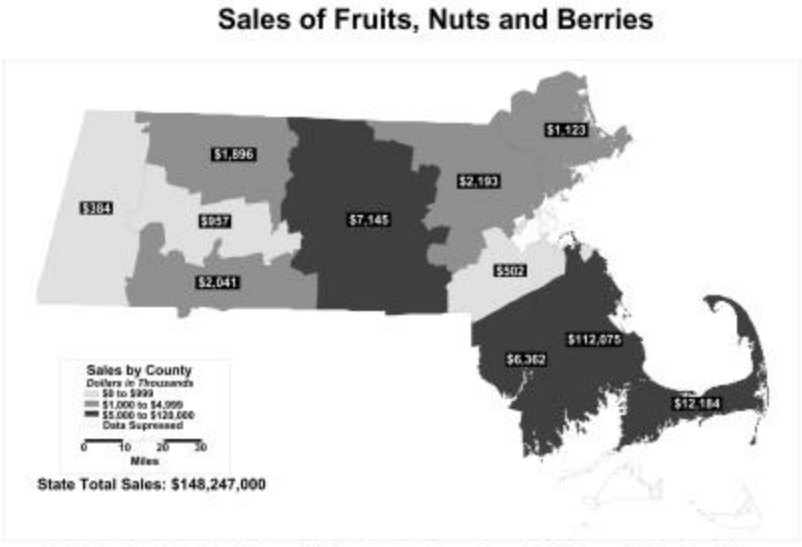
The best-performing segment of Massachusetts agriculture, cranberry production, ranked first among cash receipts in 1997. Plymouth County produced 85 percent of the state's cranberry crop in 1997, followed by Barnstable County, with 9.8 percent. These two counties, combined with Bristol County, produce 99 percent of the cranberry crop for Massachusetts.

Table 2

Massachusetts Agriculture Sales by Major Commodity Group

	Number of Farms			Sales ($1,000)		
	1997	1987	1978	1997	1987	1978
Total Agricultural Product Sales	5,574	6,216	4,946	454,404	340,464	211,994
Major crop sales						
Fruits, nuts, and berries	1,142	1,186	907	148,247	92,349	30,426
Nursery and greenhouse crops	1,375	824	749	128,192	80,867	41,032
Vegetables, sweet corn, melons	931	1,007	968	37,438	25,179	13,450
Tobacco	68	21	44	23,807	4,587	6,985
Hay, silage and feed	1,435	1,569	1,090	11,056	7,803	4,469
Major livestock sales						
Dairy and milk products	353	609	902	59,773	63,309	61,549
Poultry and eggs	375	498	458	15,900	23,149	18,504
Cattle and calves	1,158	1,725	1,803	6,424	11,297	12,181
Hogs and pigs	269	387	435	2,265	4,220	5,255
Sheep, lambs, and wool	396	563	280	475	884	230

Sources: 1997, 1987, and 1978 Census of Agriculture/USDA

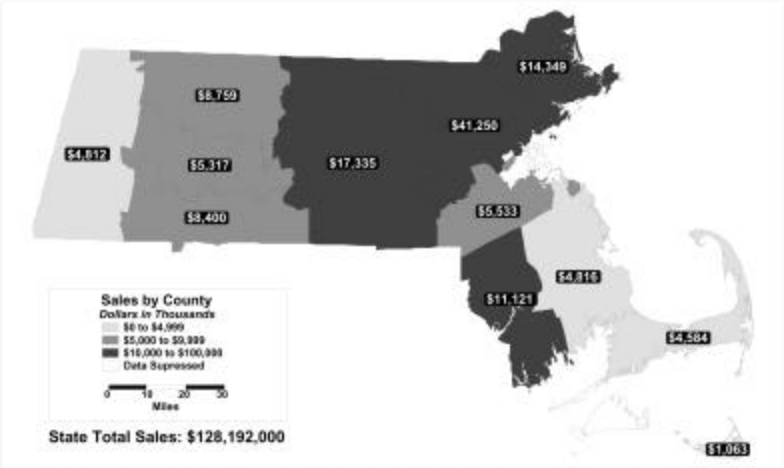


This is the top agricultural product group in Massachusetts, with cranberry production top-ranked in cash receipts.

Massachusetts accounts for 29.3 percent of New England's total apple sales. As the fourth-largest crop in the state, apples dominate fruit production in the central and western regions and account for most of Worcester County's $7.1 million in overall fruit sales. Worcester County produces 47 percent of our apples, while Middlesex, Franklin, and Hampden counties produce between 11 percent and 13 percent each. These four counties combined contributed 85 percent of the Massachusetts apple crop in 1997. Cranberry production increased by 114 percent from 1992 to 1997, while the 1997 apple crop was only 67 percent of the 1992 crop.

Nursery and greenhouse production is a blossoming sector of Massachusetts agriculture, ranking second in cash receipts. Much of this increase is attributable to the landscaping business, whose growth has been enhanced by the state's long-running construction boom. Sales have increased by 58 percent since 1987, nearly 46 percent of that growth coming after 1992. Middlesex is the leading county in nursery and greenhouse production with $41.3 million in sales for nearly one-third of the commonwealth's total in this category. Worcester and Essex follow, with 13.5 percent and 11.2 percent of the state total, respectively. Growth in this sector has been impressive throughout the state, with most counties showing increases in sales of more than 40 percent. In Berkshire County, sales more than doubled, reaching $4.8 million.

Sales of Greenhouse and Nursery Crops

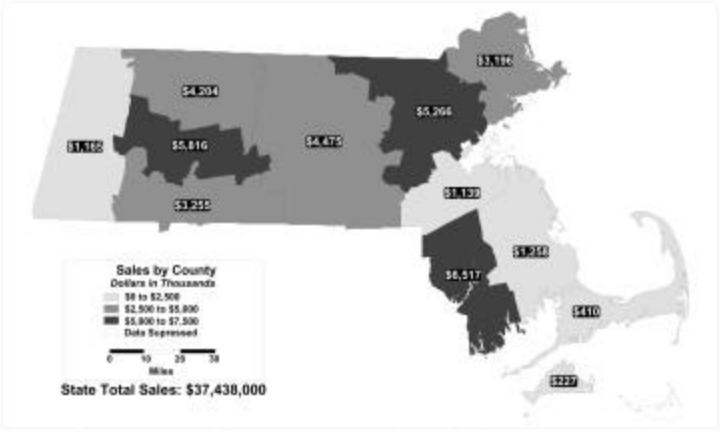


Ranked second in cash receipts, nursery and greenhouse production sales have increased by 58 percent since 1987. Nearly 46 percent of that growth occured after 1992.

While dairy sales have been fairly stable in the past ten years, there has been a significant decrease in the number of farms, which fell from 609 in 1987 to 353 in 1997. The pressure is greatest in Worcester County, where 30 percent of the dairy farms were lost. Franklin and Berkshire counties lost 20 percent each. The number has remained stable recently, in part due to institution of the Northeast Dairy Compact, whose mission includes assuring an adequate milk supply and recognizing that there are cultural as well as economic benefits to a viable dairy industry in the region.

Dairy products ranked number three in Massachusetts, with 10 percent of the New England total. Worcester County led the state in dairy production with $12.9 million of the state's $59.8 million total. Franklin County followed closely with $12.2 million, and Berkshire County contributed $9.6 million. These three counties accounted for 58 percent of the state's total dairy sales.

Sales of Vegetables, Sweet Corn, and Melons

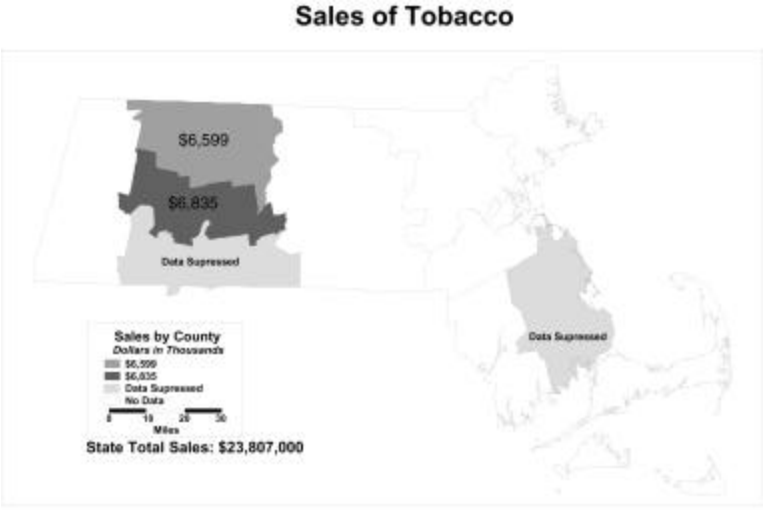


In 1997, Bristol, Hampshire, and Middlesex counties produced 47 percent of the Commonwealth's total sales in this category.

Rounding out the top five state product groups are vegetables, sweet corn, and melons; and tobacco. Bristol, Hampshire, and Middlesex counties were first, second, and third in vegetable production, respectively, producing 47 percent of the state's total. Worcester and Franklin counties combined to produce an additional 23 percent of the state's vegetables, sweet corn, and melons.

Some of the greatest increases in net farm income were on tobacco farms. Total farm sales of tobacco skyrocketed from $4.6 million in 1987 to $24 million in 1997. The amount of land allocated to tobacco crops increased steadily after 1982, increasing from 352 acres to 1,176 acres in 1997. Due to the existence of the necessary infrastructure, such as tobacco curing barns, small tractors, and racking trailers, it was possible for farmers to respond quickly to improved market prices for this high-value-per-acre specialty crop.

Tobacco production is concentrated in the Connecticut River valley. In 1997, Hampshire and Franklin counties produced 56 percent of the state's tobacco. The remainder of the commonwealth's total was most likely produced in Hampden County, a fact obscured by disclosure problems.



Tobacco production is concentrated in the Connecticut River Valley in Franklin, Hampshire, and Hampden Counties. Total sales of tobacco skyrocketed from $4.6 million in 1987 to $24 million in 1997.

Specialization and Diversification in County Agriculture

Every county in the state has experienced an increase in the number of farms since 1974. The greatest increases occurred in counties with the most farms in 1974, namely Franklin, Plymouth, and Worcester Counties. Agricultural sales increased in every county as well. The most dramatic increase occurred in Plymouth County, reflecting the success of the cranberry industry over the 1974 to 1997 period.

Figure 11 (number of farms by county)

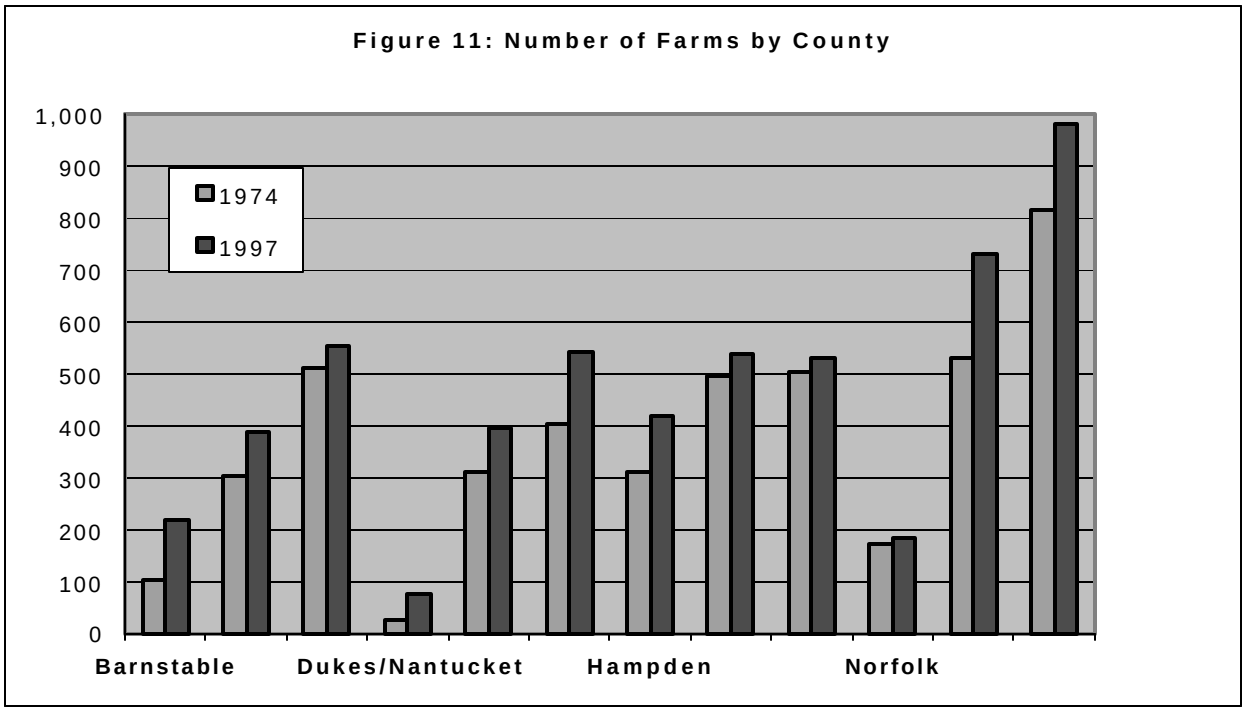
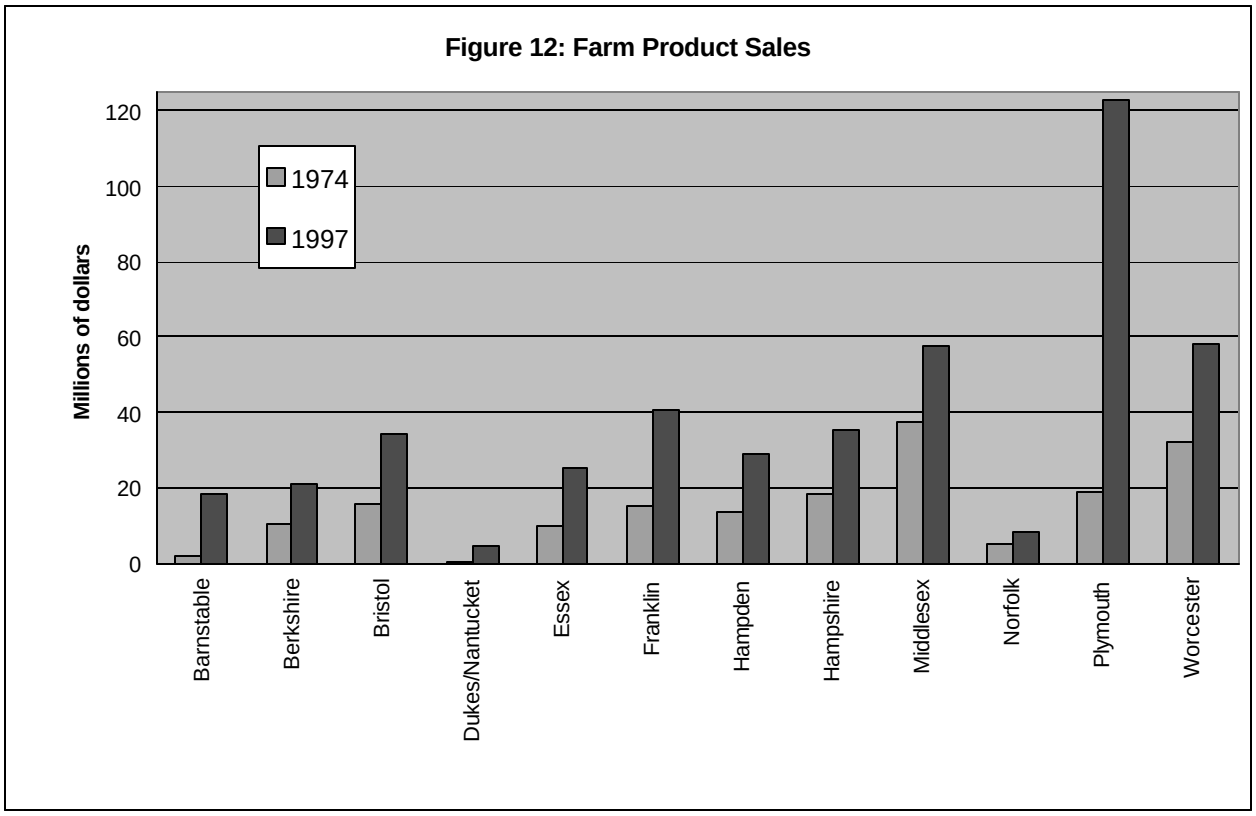


Figure 12: (farm product sales)

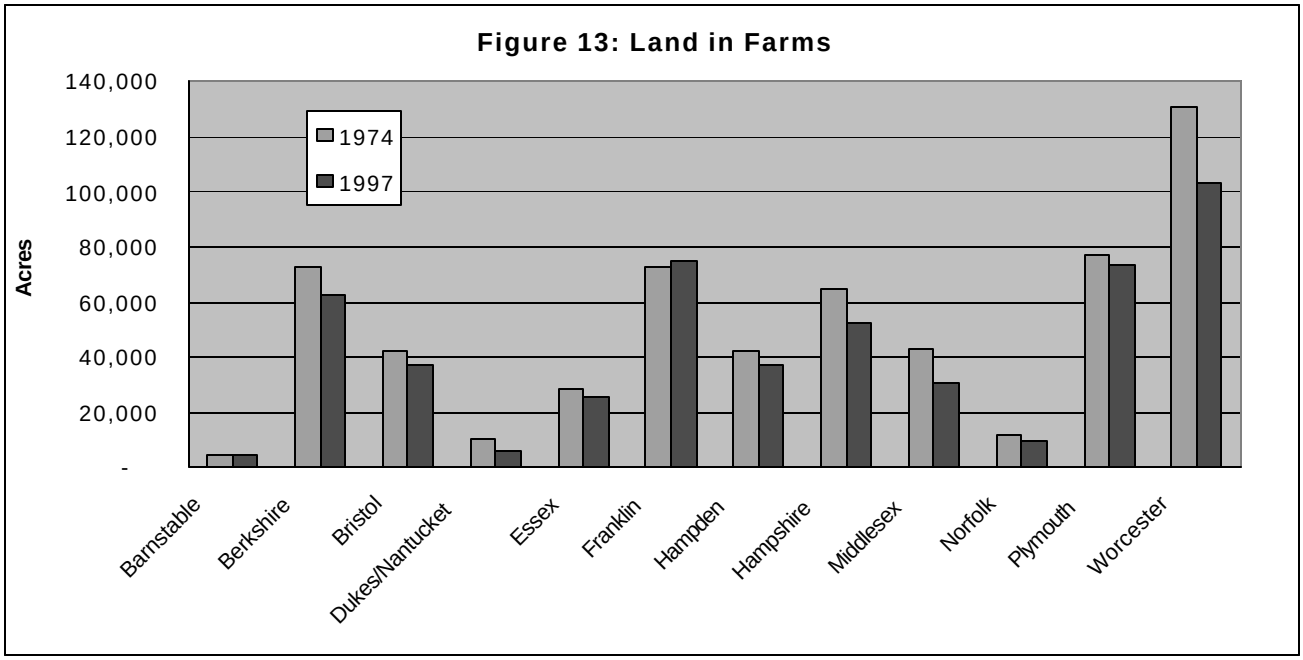


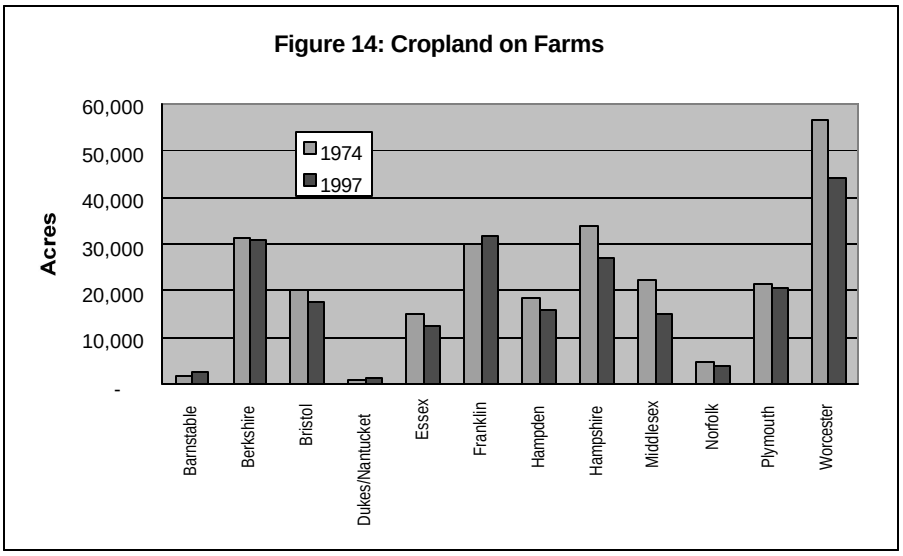
Leading Agricultural Products by County
Some counties have dominant product group; others are more diverse.

County	Leading Product Group	Total 1997 Sales (percent)	Total 1987 Sales (percent)
Plymouth	Fruits, nuts, berries	91.4	87.8
Middlesex	Nursery, greenhouse	71.6	45.3
Barnstable	Fruits, nuts, berries	66.9	59.9
Norfolk	Nursery, greenhouse	66.9	57.8
Essex	Nursery, greenhouse	57.2	48.5
Berkshire	Dairy	46.2	51.8
Nantucket	Nursery, greenhouse	36.0	15.5
Bristol	Nursery, greenhouse	32.6	40.5
Franklin	Dairy	30.0	44.8
Worcester	Nursery, greenhouse	29.9	12.8
Hampden	Nursery, greenhouse	28.9	29.7
Hampshire	Dairy	19.8	33.6
Dukes	Vegetables, sweet corn, melons	18.2	n/a

Overall, counties felt the state's losses of farm acreage and cropland. Franklin was the only county in which these increased between 1974 and 1997. Worcester County lost the most farmland, followed by Hampshire and Berkshire counties. All three experienced increased development pressure from suburban sprawl.

Figure 13 (land in farms)
Figure 14 (cropland on farms)



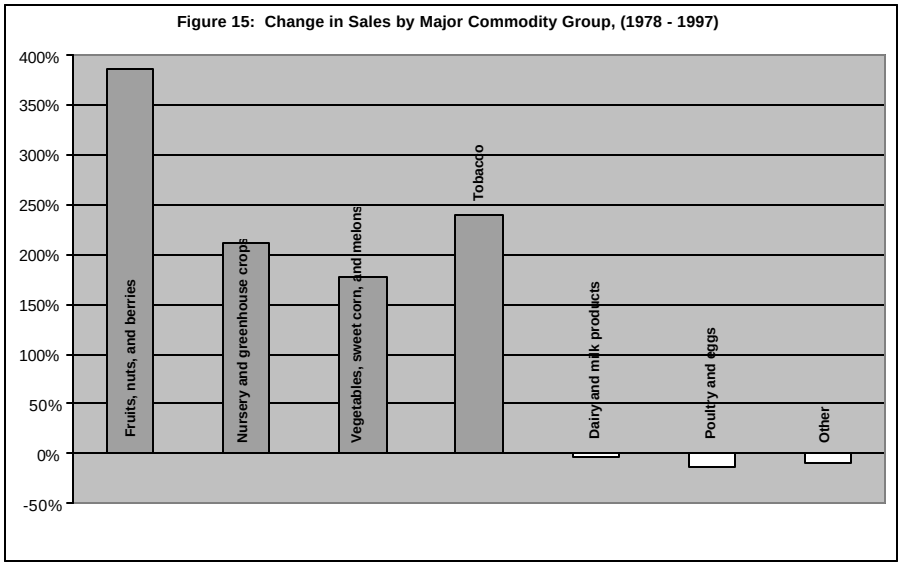


The increased importance of fruits and berries and nursery and greenhouse products to the state's agricultural economy can be seen among the number of counties where these products dominate the agricultural output. These are the top agricultural sectors in nine counties. With the exception of cranberry producers, farms typically produce a variety of crops.

Most of our counties have varied agricultural profiles, with no broad product category dominating its agricultural activity. The dramatic exception is Plymouth County, specializing in fruits, nuts and berries. More than 91 percent of its 1997 agricultural sales were devoted to this Census category. Plymouth County has been "cranberry country" for many years, and even in 1987 it had a highly specialized agricultural profile. Middlesex County demonstrates the rapid rise of nursery and greenhouse products; that category accounted for 71.6 percent of the county's agricultural sales in 1997, up from 45.3 percent in 1987.

Dairy has declined as the primary agricultural activity in most counties. Berkshire County had the highest concentration in dairy, with 46.2 percent in 1997, down about 5 percentage points since 1987. Hampshire County showed the most dramatic change as its agricultural sales from dairy fell from 33.6 percent in 1987 to less than 20 percent by 1997.

Figure 15 Change in Sales by Major Commodity Crops



Massachusetts agriculture is becoming more diverse and less dependent on traditional, mainstream agricultural products. In many counties, traditional forms of agriculture appear to be giving way to agriculture more closely tied to consumers. In Berkshire County, for example, sales in the nursery and greenhouse category increased by 109 percent form 1992 to 1997. Franklin and Hampshire Counties have also seen increases of around 40 percent since 1992. These pale, however, in comparison to increases in tobacco sales in the Connecticut River valley. Tobacco sales soared by 200 percent or more in Franklin and Hampshire counties. Given that farmers had the necessary equipment and infrastructure for production, they were able to respond rapidly to dramatic increases in tobacco prices. The data illustrate the ability of farmers to take advantage of new opportunities. By maintaining diversity in their operations, they not only spread risk but are poised to take advantage of profitable alternatives.

A COUNTY-BY-COUNTY LOOK AT THE FARMING NUMBERS

The commonwealth's counties are as diverse in their agricultural strengths as they are in any other characteristic. Following is a summary of key census data for each of the 13 counties. Additional data are provided in Appendix B.

Barnstable County

Total Acreage 253,287

	1974	1997	% Change
Land & Value			
Number of Farms	102	221	116.7%
Farm Acreage	4,495	4,746	5.6%
Farm / Total Acreage	1.8%	1.9%	5.6%
Cropland	1,897	2,493	31.4%
Market Value (in millions)	$ 2.1	$ 18.2	788.6%
Direct Sales			
Number of Farms with Direct Sales*	30	58	93.3%
Total Direct Sales (in thousands)*	$ 133	$ 259	94.7%
Direct Sales per Farm*	$ 4,433	$ 4,472	0.9%
Labor & Payroll			
Labor	553	557	0.7%
Seasonal Labor (in thousands)	456	429	-5.9%
Payroll (in thousands)	$ 569	$ 3,066	438.8%
Average Age of Farmer	56.6	53.5	-5.5%

*1974 data unavailable. 1978 data used.

Farm acreage and farm numbers increase.

Between 1974 and 1997, Barnstable County saw an increase in farm numbers, acreage, and cropland. The number of farms more than doubled over this period, while cropland increased by 31 percent. Overall farm acreage was up slightly, as well.

Market value and cash returns rise.

The market value of agricultural sales increased, and average sales per farm more than quadrupled from 1974 to 1997. These significant nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $31,837 per farm. Twenty-five percent of farms experienced net losses in 1997, reflecting an 11 percent decrease from 1987.

Major commodity groups include fruits, nuts, and berries; and nursery/greenhouse products.

Sales of crops increased in the county's major commodity group: fruit, nuts, and berries. This was due primarily to expanded cranberry production. There were also increased sales in both nursery and greenhouse crops, and vegetables, sweet corn, and melons.

The county's major commodity group in 1978 was fruits, nuts, and berries, comprising 62 percent of total agriculture sales. This group also led production in 1997, with 67 percent of sales. The number of farms in this group increased. A major portion of this was in cranberries, which increased from 43,367 hundredweight (cwt) in 1974 to 200,564 cwt in 1997.

Second in Barnstable County's agricultural sales in 1997 were nursery and greenhouse crops, comprising 25 percent of total agriculture sales. The number of farms engaged in the production of nursery and greenhouse crops grew from 24 in 1974 to 58 in 1997.

Direct sales nearly double.

The number of farms engaged in direct marketing of agricultural products nearly doubled, from 30 in 1978 to 58 in 1997. Total direct sales rose from $133,000 to $259,000. In 1997, average direct sales per farm utilizing direct marketing were $4,472.

Farm labor numbers remain steady, payrolls rise.

Hired farm labor was used on 104 farms in 1997. Farms around the county employed 557 workers, virtually the same as in 1974. Most workers were seasonal, with 429 working fewer than 150 days. Payroll in 1997 was five times as high as it was in 1974.

Average age of farmers drops; half of farmers rely on off-farm incomes.

The average age of farmers in Barnstable County was 53.5 years in 1997, a decrease from 56.6 in 1974. Fifty percent of Barnstable County farmers had principal occupations other than farming in 1997.

Berkshire County

Total Acreage 569,082

	1974	1997	% Change
Land & Value			
Number of Farms	305	387	26.9%
Farm Acreage	73,110	62,833	-14.1%
Farm / Total Acreage	12.8%	11.0%	-14.1%
Cropland	31,442	30,794	-2.1%
Market Value (in millions)	$ 10.5	$ 20.7	97.3%
Direct Sales			
Number of Farms with Direct Sales*	60	90	50.0%
Total Direct Sales (in thousands)*	$ 473	$ 684	44.6%
Direct Sales per Farm*	$ 7,883	$ 7,595	-3.7%
Labor & Payroll			
Labor	796	566	-28.9%
Seasonal Labor (in thousands)	585	391	-33.2%
Payroll (in thousands)	$ 1,147	$ 2,723	137.4%
Average Age of Farmer	53.7	55.2	2.8%

*1974 data unavailable. 1978 data used.

Farm numbers increase; acreage decreases.

Berkshire County experienced an increase in the number of farms but a loss of land in farms from 1974 to 1997. The county lost 10,277 farm acres, and cropland decreased by 648 acres.

Market value rises, many farms experience net losses.

The market value of agricultural sales in Berkshire County nearly doubled from 1974 to 1997. The average agricultural sales per farm rose from $34,446 to $53,553 during the same period. These significant nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $5,939 per farm in Berkshire County in 1997. Fifty-nine percent of farms experienced net losses in 1997, representing a 4 percent increase from 1987 but a 7 percent decline from 1992.

Major commodity groups include dairy products, nursery and greenhouse products.

While there was a downward shift in the dairy sector, there was an increase in nursery and greenhouse production. Agriculture remained diversified, with real losses in the livestock sector being compensated for by increased crop sales.

Dairy products comprised the major commodity group in Berkshire County in both 1974 and 1997. Though sales appeared to have increased, they actually decreased after adjusting for inflation. The number of dairy farms decreased approximately 61 percent, from 110 farms in 1978 to 43 in 1997. Second in sales were nursery and greenhouse products, with sales more than quadrupling to 23 percent of total sales in 1997. The number of farms engaged in the production of nursery and greenhouse crops increased from 28 in 1978 to 81 in 1997.

Direct sales increase impressively.

The number of farms engaged in direct marketing of agricultural products increased by half from 1978 to 1997, and direct-sales income increased accordingly. Average per-farm income from direct sales was $7,595 in 1997, slightly below that in 1974.

Farm labor numbers remain steady, payrolls rise.

Hired farm labor was used on 142 farms in 1997, for a total of 566 workers and $2.7 million in

payroll. This reflects a 29 percent decrease in number workers but an increase of 137 percent in labor costs. Most employees were seasonal.

Average age of farmers increases nearly three years; more farmers earn outside incomes.

Between 1974 and 1977, the average age of farmers in Berkshire County increased nearly three years, from 53.7 years to 55.2 years. Fifty percent of Berkshire County farmers had principal occupations other than farming in 1997, a 14 percent increase from 1974

.

Bristol County

Total Acreage 355,864

	1974	1997	% Change
Land & Value			
Number of Farms	511	555	8.6%
Farm Acreage	42,074	37,173	-11.6%
Farm / Total Acreage	11.8%	10.4%	-11.6%
Cropland	20,270	17,598	-13.2%
Market Value (in millions)	$ 15.7	$ 34.1	117.8%
Direct Sales			
Number of Farms with Direct Sales*	129	117	-9.3%
Total Direct Sales (in thousands)*	$ 860	$ 2,292	166.5%
Direct Sales per Farm*	$ 6,667	$ 19,587	193.8%
Labor & Payroll			
Labor	1,569	659	-58.0%
Seasonal Labor (in thousands)	1,252	410	-67.3%
Payroll (in thousands)	$ 1,856	$ 4,170	124.7%
Average Age of Farmer	53	55	3.8%

*1974 data unavailable. 1978 data used.

Farm numbers rise, while acreage drops.

Agriculture in Bristol County demonstrated growth in farm numbers but a loss in total farm and cropland. Farm numbers increased from 511 in 1974 to 675 in 1987, but subsequently declined to 555 farms in 1997. Farm acreage decreased by 4,901 acres, and cropland decreased by nearly 3,000 acres.

Market value and cash returns rise.

The market value of agricultural sales in Bristol County more than doubled, from $15.7 million in 1974 to $34.1 million in 1997. Average sales per farm also increased, from $30,640 in 1974 to $61,444 in 1997. These significant nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods.

Major commodity groups include nursery and greenhouse crops, and dairy products.

Agriculture remained diversified, with large losses in the livestock sector being compensated for by increased crop sales. An increase in fruits, nuts, and berries was due primarily to heavier production of cranberries.

The majority of agricultural sales in 1997 were from nursery and greenhouse crops, which increased from less than 25 percent of the county's total agricultural sales in 1978 to 33 percent in 1997. The number of farms engaged in the production of nursery and greenhouse crops increased from 75 to 124.

Second in agricultural sales were dairy products. This was the major production group in 1978, comprising 35 percent of total sales, but it slid to second in 1997, with 21 percent. The number of dairy farms decreased by more than half, from 93 in 1978 to 36 in 1997. Though sales appeared to have increased, they actually decreased when adjusted for inflation.

Also strong in sales were vegetables, sweet corn, and melons; and fruits, nuts, and berries, together comprising 19 percent of the total. Growth in this category was bolstered by the expansion in cranberry production from 405 acres to 654 acres.

Direct sales more than double, in spite of fewer farms participating.

The number of farms engaged in direct marketing of agricultural products decreased from 129 in 1978 to 117 in 1997, but total direct-sales revenue increased from $860,000 to $2,292,000. Average direct sales for farms using direct marketing were $19,587 in 1997. Net cash returns from agricultural sales averaged $19,835 per farm in Bristol County in 1997. Fifty-one percent of farms experienced net

losses in 1997, a slight decrease from 53 percent 1987.

Farm labor numbers drop by over half, and payrolls more than double.

Hired labor was used on 166 farms in 1997. Farm employees totaled 659 workers, receiving $4.2 million in payroll. Most employees were seasonal, with 410 working fewer than 150 days.

Average age of farmers increases by two years; more farmers earn outside incomes.

The average age of farmers in Bristol County was 55 years in 1997, an increase from 53 years in 1974. Forty-four percent of Bristol County farmers had principal occupations other than farming in 1997, an increase from 35.

Dukes County

Total Acreage 66,445

	1974	1997	% Change
Land & Value			
Number of Farms	22	64	190.9%
Farm Acreage	9,116	4,896	-46.3%
Farm / Total Acreage	13.7%	7.4%	-46.3%
Cropland	786	1,365	73.7%
Market Value (in millions)	$ 0.2	$ 1.3	662.2%
Direct Sales			
Number of Farms with Direct Sales*	19	21	10.5%
Total Direct Sales (in thousands)*	N/A	$ 268	N/A
Direct Sales per Farm*	N/A	$ 12,753	N/A
Labor & Payroll			
Labor	51	157	207.8%
Seasonal Labor (in thousands)	43	111	158.1%
Payroll (in thousands)	$ 48	(D)	N/A
Average Age of Farmer	51.9	51.5	-0.8%

*1974 data unavailable. 1978 data used.

Farm numbers increase, but farm acreage declines markedly.
The number of farms in Dukes County nearly tripled, from 22 in 1974 to 64 in 1997. Cropland increased from 1974 to 1987 but then declined by 1997, for a net gain of 579 acres. Similarly there was an increase in farm acreage, from 9,116 acres in 1974 to 11,782 acres in 1978, followed by a decline to 4,896 acres in 1997. This reflects a net loss of 4,220 acres.

Market values rise, while a majority of farms see net losses.
The market value of agricultural sales in the county increased from $164,000 in 1974 to $1.25 million in 1997. The average agricultural sales per farm also increased, rising from $7,455 to $19,524. These significant nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $1,092 per farm in 1997. Sixty-two percent of farms experienced net losses in 1997, a 3 percent drop from 1987.

Major commodity groups include vegetables, sweet corn, and melons; and other livestock and livestock products.
The major commodity groups in 1997 were vegetables, sweet corn, and melons, with $227,000 in sales, and other livestock and livestock products, with $175,000 in sales.

Direct marketing takes hold.
Direct sales numbers were unavailable in 1974; there are indications that they were nonexistent at that time. In 1997, direct sales comprised 20 percent of total farm sales. The number of farms engaged in direct marketing of agricultural products was 21, with total direct sales of $268,000. Average direct sales from farms engaging in direct marketing were $12,753.

Farm labor numbers increase substantially.
In 1997, 157 laborers worked on 25 farms in Dukes County, three times as many as in 1974. More than two-thirds of these were seasonal, working fewer than 150 days.

Average age of farmers increases only slightly; half of farmers rely on off-farm incomes.
The average age of farmers in Dukes County was 51.5 years in 1997, not much different from the previous average of 51.9 in 1974. Fifty percent of

Dukes County farmers had principal occupations other than farming in 1997.

Essex County

Total Acreage 318,764

	1974	1997	% Change
Land & Value			
Number of Farms	311	396	27.3%
Farm Acreage	28,868	25,547	-11.5%
Farm / Total Acreage	9.1%	8.0%	-11.5%
Cropland	15,175	12,427	-18.1%
Market Value (in millions)	$ 9.9	$ 25.1	152.8%
Direct Sales			
Number of Farms with Direct Sales*	87	79	-9.2%
Total Direct Sales (in thousands)*	$ 1,356	$ 2,122	56.5%
Direct Sales per Farm*	$ 15,586	$ 26,867	72.4%
Labor & Payroll			
Labor	132	187	41.7%
Seasonal Labor (in thousands)	994	703	-29.3%
Payroll (in thousands)	$ 2,071	$ 5,151	148.7%
Average Age of Farmer	55.1	55.6	0.9%

*1974 data unavailable. 1978 data used.

Farm numbers increase, acreage decreases.

Essex County experienced an increase in the number of farms but a net loss of farmland and cropland between 1974 and 1997. Farm acreage lost 3,321 acres, while cropland decreased by 2,748 acres.

Market value rises; half of farms experience net losses.

The market value of agricultural sales in Essex County increased from $9.9 million in 1974 to $25.1 million in 1997. Average agricultural sales per farm more than doubled, rising from $31,916 in 1974 to $63,361 in 1997. These significant nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $23,055 per farm in 1997. Fifty-one percent of farms experienced net losses in 1997, 7 percent fewer than in 1987.

Major commodity groups include nursery and greenhouse crops and vegetables, sweet corn, and melons.

Agriculture remained diversified, with real losses in the livestock sector being compensated for by increases in crop production. The majority of agricultural sales in 1997 were from nursery and greenhouse crops. This category experienced a rapid increase, nearly doubling from less than 29 percent of total agricultural sales in 1978 to 57 percent in 1997. The number of farms engaged in the production of nursery and greenhouse crops also doubled, from 75 farms in 1978 to 150 in 1997.

Second in agricultural sales were vegetables, sweet corn, and melons, which decreased slightly from 15 percent of total sales in 1978 to less than 13 percent in 1997. Dairy products slipped to third in sales by 1987, comprising 13 percent of the county's total. Along with a decrease in dairy product sales, the number of dairy farms decreased by more than half, from 34 farms in 1978 to 13 in 1997.

Direct sales rise, though number of participating farms declines.

Direct-to-consumer sales increased, though the number of farms using direct sales decreased. The number of farms engaged in direct marketing of agricultural products dropped from 87 in 1978 to 79 in 1997. Total income from direct sales rose from $1.4 million to $2.1 million. Average direct sales from farms using direct marketing were $26,867 in 1997.

Farm labor numbers rise, payroll more than doubles.

Hired farm labor was used on 187 farms in 1997, a 41 percent increase over 1974. Farm employees totaled 978 workers receiving $5.2 million in payroll, a considerable increase from $2 million in 1974.

Most employees were seasonal, with 703 working fewer than 150 days.

Average age of farmers increases slightly; more farmers earn outside incomes.

The average age of farmers in Essex County was 55.6 years in 1997, a slight increase from the former average of 55.1 years 1974. Forty-nine percent of farmers had principal occupations other than farming in 1997, up from 44 percent in 1974.

Franklin County

Total Acreage 449,373

	1974	1997	% Change
Land & Value			
Number of Farms	404	543	34.4%
Farm Acreage	72,909	75,134	3.1%
Farm / Total Acreage	16.2%	16.7%	3.1%
Cropland	29,290	31,698	8.2%
Market Value (in millions)	$ 15.1	$ 40.7	169.1%
Direct Sales			
Number of Farms with Direct Sales*	90	135	50.0%
Total Direct Sales (in thousands)*	$ 348	$ 1,746	401.7%
Direct Sales per Farm*	$ 3,867	$ 12,933	234.4%
Labor & Payroll			
Labor	4,980	1,490	-70.1%
Seasonal Labor (in thousands)	4,586	1,047	-77.2%
Payroll (in thousands)	$ 3,330	$ 9,257	178.0%
Average Age of Farmer	53	53	0.0%

*1974 data unavailable. 1978 data used.

Farm size, cropland, and number of farms increase.

Despite recent losses, Franklin County experienced an overall increase in the number of farms, land in farms, and cropland between 1974 and 1997. Farm numbers increased from 404 in 1974 to 616 in 1987 but then declined to 543 in 1997. Similarly, farm acreage increased from 72,909 acres in 1974 to 82,864 acres in 1987, but declined to 75,134 acres in 1997. Cropland increased from 29,920 acres in 1974 to 33,548 in 1987, then dropped to 31,698 acres in 1997.

Market value rises, though half of farms experience net losses.

The market value of agricultural sales in Franklin County more than doubled, from $15.1 million in 1974 to $40.7 million in 1997. The average agricultural sales per farm also doubled, rising from $37,438 in 1974 to $74,962 in 1997. These significant nominal increases were real when dollar values were adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $14,500 per farm in Franklin County in 1997. Forty-eight percent of farms experienced net losses in 1997, a 4 percent decrease from 1987.

Major commodity groups include dairy products and nursery and greenhouse crops.

In both 1978 and 1997, the major commodity group in Franklin County was dairy products. This comprised 30 percent of the county's total agricultural sales. The number of dairy farms decreased from 141 in 1978 to 79 in 1997. Though sales appeared to have increased, they actually show a decrease when dollar values are adjusted for inflation.

Second in sales to dairy products in 1997 were nursery and greenhouse crops. This category experienced a dramatic increase, rising from less than 3 percent of Franklin County's total agricultural sales in 1978 to nearly 22 percent in 1997. The number of farms engaged in the production of nursery and greenhouse crops nearly quadrupled, from 29 in 1978 to 114 in 1997. Tobacco sales dropped from 14 percent of total sales in 1978 to less than 1 percent in subsequent years, then made a comeback to 16 percent by 1997.

Direct sales rise substantially.

Direct sales increased, as did the number of farms using them. The number of farms engaged in direct marketing increased from 90 in 1978 to 135 in 1997, with total direct sales rising from $0.3 million to $1.7

million. Average direct sales per farm using direct marketing were $12,933 in 1997.

Farm labor numbers drop 70 percent, while payrolls rise.

Hired farm labor was used on 258 farms in 1997. The number of farm employees dropped dramatically, from 4,980 in 1974 to 1,490 in 1997. Payroll during the period increased 178 percent, from $3.3 million to $9.3 million. Most employees were seasonal, with 1,047 working fewer than 150 days.

Average age of farmers is unchanged; more farmers earn outside incomes.

The average age of farmers in Franklin County was 53 years in 1997, unchanged from 1974. Fifty percent of Franklin County farmers had principal occupations other than farming in 1997, compared to just 34 percent in 1974.

Hampden County

Total Acreage 395,851

	1974	1997	% Change
Land & Value			
Number of Farms	311	418	34.4%
Farm Acreage	42,123	37,417	-11.2%
Farm / Total Acreage	10.6%	9.5%	-11.2%
Cropland	18,468	16,114	-12.7%
Market Value (in millions)	$ 13.6	$ 29.1	114.1%
Direct Sales			
Number of Farms with Direct Sales*	80	102	27.5%
Total Direct Sales (in thousands)*	$ 615	$ 1,409	129.1%
Direct Sales per Farm*	$ 7,688	$ 13,811	79.6%
Labor & Payroll			
Labor	3,634	1,406	-61.3%
Seasonal Labor (in thousands)	3,292	969	-70.6%
Payroll (in thousands)	$ 3,326	$ 7,152	115.0%
Average Age of Farmer	54.6	56.7	3.8%

*1974 data unavailable. 1978 data used.

Farm numbers increase, acreage and cropland decline.

Hampden County experienced an increase in the number of farms, while losing land in farms and cropland from 1974 to 1997. Farm numbers increased from 311 in 1974 to 490 in 1987, but then declined to 418 farms in 1997. There was an increase in farm acreage from 42,123 acres in 1974 to 46,747 acres in 1987 but then a decline to 37,417 acres in 1997. Similarly, cropland increased from 18,468 acres in 1974 to 19,764 in 1978 but then declined to 16,114 acres in 1997, for an overall decrease of 2,354 acres.

Market values and sales rise, but farms experience net losses.

The market value of agricultural sales in Hampden County more than doubled, from $13.6 million in 1974 to $29.1 million in 1997. The average agricultural sales per farm also increased, rising from $43,714 in 1974 to $69,633 in 1997, a gain of $25,919 per farm. These significant nominal increases are real when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $15,576 per farm in Hampden County in 1997. Fifty-seven percent of farms experienced net losses in 1997, a 7 percent increase from 1987.

Major commodity group is nursery and greenhouse crops.

The major production commodity group in Hampden County was nursery and greenhouse crops, with $8.4 million in sales in 1997. This group more than doubled, from 13 percent of total agricultural sales in 1974 to 29 percent in 1997. Tobacco sales may have rivaled nursery and greenhouse sales. Tobacco sales were not disclosed in 1997, however.

The second commodity group in sales, dairy products, declined in production from 25 percent of total agricultural sales in 1978 to 19 percent in 1992. The number of dairy-producing farms fell by almost two-thirds—from 64 in 1978 to only 22 in 1997.

Direct sales income more than doubles.

The number of farms engaged in direct marketing of agricultural products increased from 80 farms in 1978 to 102 in 1997, with total direct sales rising from $0.6 million to $1.4 million. In 1997, average direct sales per farm using direct marketing were $13,811.

Farm labor numbers remain steady, payrolls rise.

Hired farm labor was used on 159 farms in 1997. Farm employees totaled 1,406 workers, down 61 percent from 1974. Payroll in 1997 totaled $7.2 million, up 115 percent, in spite of much smaller labor numbers. Most employees were seasonal, with 969 working fewer than 150 days.

Average age of farmers rises; more farmers earn outside incomes.

The average age of farmers in Hampden County was 56.7 years in 1997, up from the 1974 average of 54.6. Fifty percent of Hampden County farmers had principal occupations other than farming in 1997, while only 31 percent were principally employed in off-farm occupations in 1974.

Hampshire County

Total Acreage 338,578

	1974	1997	% Change
Land & Value			
Number of Farms	495	539	8.9%
Farm Acreage	64,891	52,092	-19.7%
Farm / Total Acreage	19.2%	15.4%	-19.7%
Cropland	33,662	26,865	-20.2%
Market Value (in millions)	$ 18.2	$ 35.5	94.9%
Direct Sales			
Number of Farms with Direct Sales*	115	127	10.4%
Total Direct Sales (in thousands)*	$ 966	$ 1,562	61.7%
Direct Sales per Farm*	$ 8,400	$ 12,303	46.5%
Labor & Payroll			
Labor	2,803	1,554	-44.6%
Seasonal Labor (in thousands)	2,439	1,240	-49.2%
Payroll (in thousands)	$ 2,754	$ 6,198	125.1%
Average Age of Farmer	55.8	54.4	-2.5%

*1974 data unavailable. 1978 data used.

Farm numbers increase, while acreage and cropland decrease significantly.

Hampshire County experienced an overall increase in the number of farms, while losing land in farms and cropland between 1974 and 1997. Farm numbers increased from 495 in 1974 to 624 in 1987 but then declined to 539 farms in 1997. In contrast, farm acreage declined from 64,891 acres in 1974 to 52,092 acres in 1997. Cropland decreased more than 20 percent, from 33,662 acres in 1974 to 26,865 acres in 1997.

Market value nearly doubles, and sales climb impressively.

Agriculture in Hampshire County demonstrated sales growth from 1974 to 1997, despite continued losses of land in farms and cropland. The market value of agricultural sales in Hampshire County increased from $18.2 million in 1974 to $35.5 million in 1997. The average agricultural sales per farm also increased, rising from $36,808 in 1974 to $65,888 in 1997, an increase of $29,080. These significant increases are real when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods.

Net cash returns from agricultural sales averaged $16,465 per farm in Hampshire County in 1997. Forty-eight percent of farms experienced net losses in 1997, a 5 percent decrease from 1987.

Major commodity groups include dairy; tobacco; vegetables, sweet corn, and melons; and nursery and greenhouse crops.

While there was a downward shift in the dairy sector, there was an increase in nursery and greenhouse production and in tobacco production. The major commodity group was still dairy products, with $7 million in sales in 1997, representing 20 percent of all agricultural sales. This reflects a decline of 15 percent from 1978. Dairy farm numbers also decreased, from 114 in 1978 to 43 in 1997. Tobacco represented 19 percent of sales; vegetables, sweet corn, and melons comprised 16 percent; and nursery and greenhouse crops contributed 15 percent to overall sales.

Direct sales dollars nearly double.

Direct to consumer sales and the number of farms using direct sales increased. The number of farms engaged in direct marketing of agricultural products increased from 115 farms in 1978 to 127 in 1997, with total direct sales rising from $0.9 million to $1.6 million. Average direct sales per farm using direct marketing were $12,303 in 1997.

Farm labor numbers drop, payrolls more than double.

Hired farm labor was used on 201 farms in 1997. Farm employees totaled 1,554 workers, a drop of 45 percent since 1974. Most employees were seasonal, with 1,240 working fewer than 150 days. Farm payroll more than doubled, increasing from $2.8 million in 1974 to $6.2 million in 1997.

Average age of farmers declines, more farmers earn outside incomes.

The average age of farmers in Hampshire County was 54.4 years in 1997, down from the 1974 average of 55.8. Forty-eight percent of Hampshire County farmers had principal occupations other than farming in 1997, while only 38 percent were principally employed in off-farm occupations in 1974.

Middlesex County

Total Acreage 527,069

	1974	1997	% Change
Land & Value			
Number of Farms	504	531	5.4%
Farm Acreage	42,974	30,718	-28.5%
Farm / Total Acreage	8.2%	5.8%	-28.5%
Cropland	22,320	15,253	-31.7%
Market Value (in millions)	$ 37.6	$ 57.6	52.9%
Direct Sales			
Number of Farms with Direct Sales*	128	150	17.2%
Total Direct Sales (in thousands)*	$ 1,173	$ 2,905	147.7%
Direct Sales per Farm*	$ 9,164	$ 19,369	111.4%
Labor & Payroll			
Labor	3,397	1,940	-42.9%
Seasonal Labor (in thousands)	2,201	1,356	-38.4%
Payroll (in thousands)	$ 7,951	$ 11,192	40.8%
Average Age of Farmer	53.4	55.1	3.2%

*1974 data unavailable. 1978 data used.

Farm numbers increase, while acreage and cropland drop.

Middlesex County experienced an increase in the number of farms from 504 farms in 1974 to 569 in 1987, but subsequently saw a decline to 531 farms in 1997. Land in farms fell from 42,974 acres in 1974 to 30,718 acres in 1997, while cropland fell from 22,320 acres in 1974 to 15,253 acres in 1997, a decrease of 7,067 acres.

Market value and cash returns rise, but number of farms netting losses increases.

The market value of agricultural sales in Middlesex County increased from $37.6 million in 1974 to $57.6 million in 1997. Average agricultural sales per farm also increased, rising from $74,687 to $108,421. These significant increases are real when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. In 1997, net cash returns from agricultural sales averaged $42,312 per farm. Fifty-seven percent of farms experienced net losses in 1997, up from 44 percent in 1987.

Major commodity group is nursery and greenhouse crops.

The major commodity group in Middlesex County was nursery and greenhouse crops, with $41.3 million in sales in 1997. This commodity almost doubled, from 39 percent of total agricultural sales in 1974 to 72 percent in 1997. Vegetables, sweet corn, and melons, accounted for 9 percent of sales, and fruit, nuts and berries, contributed 4 percent of the total. Dairy products were a close fourth, in spite of having declined from 7 percent of total agricultural sales in 1978 to less than 4 percent in 1997. The number of dairy farms in the country fell from 51 in 1978 to 10 in 1997.

Large losses also occurred in the other livestock sectors. In 1978 poultry and poultry products comprised 7 percent of agricultural sales. Hogs and pigs made up 4 percent, and cattle and calves, 2 percent. By 1997, each of these livestock sectors had declined to less than 1 percent of sales.

Direct sales dollars more than double.

The number of farms engaged in direct marketing of agricultural products increased from 128 farms in 1978 to 150 in 1997, a gain of 22 farms. Total direct sales rose from $1.2 million to $2.9 million. In 1997, average direct sales per farm utilizing direct marketing were $19,369.

Number of farm employees drops, while payrolls rise.

Hired farm labor was used on 278 farms in 1997. There were 1,940 workers, a drop from 3397 in 1974. Total farm payroll rose from under $8 million to $11.2 million in 1997. Most employees were seasonal, with 1,356 working fewer than 150 days in 1997.

Average age of farmers increases; more farmers earn outside incomes.

The average age of farmers in Middlesex County was 55.1 years in 1997, up from 53.4 in 1974. Forty-seven percent of Middlesex County farmers had principal occupations other than farming in 1997, while only 40 percent had been principally employed in off farm employment in 1974.

Nantucket County

Total Acreage 30,580

	1974	1997	% Change
Land & Value			
Number of Farms	6	14	133.3%
Farm Acreage	1,044	1,049	0.5%
Farm / Total Acreage	3.4%	3.4%	0.5%
Cropland	276	na	na
Market Value (in millions)	$ 0.2	$ 3.0	1841.4%
Direct Sales			
Number of Farms with Direct Sales*	2	4	100.0%
Total Direct Sales (in thousands)*	na	na	na
Direct Sales per Farm*	na	na	na
Labor & Payroll			
Labor	48	129	168.8%
Seasonal Labor (in thousands)	35	na	na
Payroll (in thousands)	$ 65	$ 1,001	1440.0%
Average Age of Farmer	39.6	43.6	10.1%

*1974 data unavailable. 1978 data used.

Farm number and cropland acreage increase, as farms get smaller.

Nantucket County experienced an increase in the number of farms and cropland acreage from 1974 until 1997, while total land in farms remained unchanged. Farm numbers more than doubled, from six in 1974 to 14 in 1997. Cropland increased from 276 acres in 1974 to 518 acres in 1987. Irrigated land increased from 216 acres in 1974 to 332 acres in 1997. Land in farms was 1,044 acres in 1974 and remained stable.

Market value and sales rise dramatically.

Land was more intensively managed, and marketing increased, boosting sales by a noteworthy 800 percent over 23 years. The market value of agricultural sales in Nantucket County increased from $152,000 in 1974 to $3 million in 1997. Average agricultural sales per farm also increased significantly, rising from $25,333 in 1974 to $210,821 in 1997. These nominal increases were real increases when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged only $329 per farm in 1997. Forty-three percent of farms experienced net losses in 1997, down 7 percent from 1987.

Major commodity group is nursery and greenhouse crops.

The major commodity group in Nantucket County was nursery and greenhouse crops, sold by 12 farms in 1997 and comprising 36 percent of agricultural sales. This represents a gain of 19 percent over 1974. Vegetables, sweet corn, and melons were grown on four farms; and fruits, nuts, and berries were produced on three farms in 1997.

Direct marketing is limited.

Four of fourteen farms engaged in direct marketing of agricultural products in 1997. Dollar figures were unavailable.

Farm labor numbers increase, and payrolls rise.

Hired farm labor was used on 10 farms in 1997, up from 6 farms in 1978. Farm employees totaled 129 workers, receiving $1 million in payroll, compared to 48 workers earning $65,000 in 1978.

Average age of farmers fluctuates; most work on farms full time.

The average age of farmers in Nantucket County was 43.6 years in 1997. This was slightly higher than the average of 39.6 in 1974, but significantly lower than the 51.5 years reported in 1982. Almost all Nantucket farmers were full-time farmers in 1997; only 7 percent had principal occupations other than farming in 1997.

Norfolk County

Total Acreage 255,746

	1974	1997	% Change
Land & Value			
Number of Farms	172	185	7.6%
Farm Acreage	11,965	9,869	-17.5%
Farm / Total Acreage	4.7%	3.9%	-17.5%
Cropland	4,713	3,856	-18.2%
Market Value (in millions)	$ 5.1	$ 8.3	61.1%
Direct Sales			
Number of Farms with Direct Sales*	41	50	22.0%
Total Direct Sales (in thousands)*	$ 304	$ 596	96.1%
Direct Sales per Farm*	$ 7,415	$ 11,922	60.8%
Labor & Payroll			
Labor	542	349	-35.6%
Seasonal Labor (in thousands)	375	236	-37.1%
Payroll (in thousands)	$ 746	$ 2,049	174.7%
Average Age of Farmer	55.4	54.7	-1.3%

*1974 data unavailable. 1978 data used.

Farm number, farm acreage, and cropland drop.

Norfolk County experienced an initial increase but then a rapid loss in the number of farms, land in farms, and cropland between 1974 and 1997. The county saw an increase from 172 farms in 1974 to 212 in 1987, followed by a declined to 185 in 1997. Similarly, there was an increase in farmland from 11,965 acres in 1974 to 14,013 acres in 1978, then a decline to 9,869 acres in 1997, for a net loss of 2,096 acres. Cropland increased from 4,713 acres in 1974 to 6,567 acres in 1987, a gain of 1,854 acres. It then declined to 3,856 in 1997, losing 857 acres overall.

Market value stagnates; half of farms realize net annual losses.

The market value of agricultural sales in Norfolk County increased from $5.1 million in 1974 to $13.2 million in 1987, then fell to $8.3 million in 1997 for an overall gain of $3.2 million. Average agricultural sales per farm followed a similar cycle, doubling from $29,826 in 1974 to $62,454 in 1987, then falling to $44,680 in 1997, for a final increase of $14,854. Sales in 1997 were not much higher than those in 1974, when adjusted for inflation with the Producers Price Index for agricultural goods.

Net cash returns from agricultural sales averaged $7,974 per farm in Norfolk County in 1997. Fifty-three percent of farms experienced net losses in 1997, a 5 percent decrease from 1987.

Major commodity groups include nursery and greenhouse crops, and vegetables, sweet corn, and melons.

Agriculture remained diversified, but recent real losses among all sectors were troubling. The major commodity group in Norfolk County was nursery and greenhouse crops, with $5.5 million in sales in 1997. This commodity rose from 53 percent of total agricultural sales in 1974 to 67 percent in 1997. Vegetables, sweet corn, and melons were second in sales, with 14 percent of the total, compared with 7 percent in 1978. Dairy products declined from 16 percent of total agricultural sales in 1978 to 7 percent in 1997. The number of dairy farms fell by half, from 21 in 1978 to only 10 in 1997. Additionally, all livestock categories experienced decreased sales over the last four census years.

Direct-sales dollars nearly double.

The number of farms engaged in direct marketing of agricultural products increased from 41 farms in 1978 to 50 in 1997, with total direct sales climbing from $304,000 to $596,000. Average direct sales per farm utilizing direct marketing were $11,922 in 1997.

Farm labor numbers drop, payrolls more than double.

Hired farm labor was used on 76 farms in 1997. Farm employees totaled 349 workers, down from 542 in 1974. Total farm payroll increased from $746,000 to more than $2 million. Most employees were seasonal, with 236 working fewer than 150 days.

Average age of farmers drops slightly, while more rely on off-farm incomes.

The average age of farmers in Norfolk County was 54.7 years in 1997, down slightly from 55.4 years in 1974. Fifty percent of Norfolk County farmers had principal occupations other than farming in 1997, while only 36 percent had been principally employed in off-farm occupations in 1974.

Plymouth County

Total Acreage 422,775

	1974	1997	% Change
Land & Value			
Number of Farms	532	732	37.6%
Farm Acreage	77,404	73,418	-5.1%
Farm / Total Acreage	18.3%	17.4%	-5.1%
Cropland	21,561	20,665	-4.2%
Market Value (in millions)	$ 18.8	$ 122.7	554.2%
Direct Sales			
Number of Farms with Direct Sales*	86	75	-12.8%
Total Direct Sales (in thousands)*	$ 300	$ 763	154.3%
Direct Sales per Farm*	$ 3,488	$ 10,174	191.7%
Labor & Payroll			
Labor	2,540	2,311	-9.0%
Seasonal Labor (in thousands)	2,105	1,203	-42.9%
Payroll (in thousands)	$ 3,527	$ 20,076	469.2%
Average Age of Farmer	56.2	54.3	-3.4%

*1974 data unavailable. 1978 data used.

Farm number increases, while acreage in farmland and cropland decreases.

Plymouth County experienced an increase in the number of farms, while losing land in farms and cropland from 1974 to 1997. Farm numbers initially increased from 532 farms in 1974 to 775 in 1987, then declined to 732 farms in 1997. Though there was an initial increase in farm acreage, from 77,404 acres in 1974 to 82,924 acres in 1978, there was a decline to 73,418 acres in 1997, for an overall loss of 3,986 acres. Cropland increased from 21,561 acres in 1974 to 23,481 in 1987, but then declined to 20,665 in 1997, for a final loss of 896 acres.

Market value represents 27 percent of state's agricultural sales.

The market value of agricultural sales increased almost six-fold, from $18.8 million in 1974 to $122.7 million in 1997. This accounted for a noteworthy 27 percent of all Massachusetts agricultural sales. Average agricultural sales per farm also increased dramatically, from $35,214 in 1974 to $167,605 in 1997. These significant increases are real when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $61,143 per farm in 1997. Twenty-eight percent of farms experienced net losses in 1997, a 13 percent decrease from the 41 percent experiencing losses in 1987.

Major commodity groups include fruits, nuts, and berries; and nursery and greenhouse crops.

The major commodity group in Plymouth County was fruits, nuts, and berries. This commodity accounted for 64 percent of total agricultural sales in 1978 and 91 percent in 1997. The number of farms producing fruits, nuts, and berries increased from 335 farms in 1978 to 452 in 1997. A major portion of the increase was due to cranberry sales. Cranberry production increased dramatically, from 673,297 hundredweight (cwt) in 1974 to 1,732,138 cwt in 1997.

Second in Plymouth County agricultural sales in 1997 was nursery and greenhouse crops, comprising 4 percent of Plymouth County's total agricultural sales. The number of farms engaged in the production of nursery and greenhouse crops more than doubled, from 51 in 1974 to 104 in 1997. Dairy products declined from 15 percent of the county's total sales in 1978 to 2 percent in 1997. The number of dairy farms dropped from 37 in 1978 to only 11 in 1997.

Direct sales increase, though number of direct-sales farms decreases.

Though the number of farms engaged in direct marketing of agricultural products fell from 86 farms in 1978 to 75 in 1997, total direct sales dollars more than doubled, from $300,000 to $763,000. Average direct sales per farm using direct marketing were $10,174 in 1997.

Farm labor numbers decrease slightly, while payrolls rise dramatically.

Hired farm labor was used on 308 farms in 1997, up from 226 in 1974. Farm employees totaled 2,311 workers in 1997, slightly down from 1974 numbers. Total farm payroll in 1997 was $20.1 million, compared with $3.5 million in 1974. Approximately half of farm employees were seasonal, with 1,203 working fewer than 150 days.

Average age of farmers declines, and 40 percent of farmers rely on off-farm incomes.

The average age of farmers in Plymouth County was 54.3 years in 1997, slightly down from the 1974 average of 56.2. Forty percent of Plymouth County farmers had principal occupations other than farming in 1997, just slightly more than the 43 percent in 1974.

Suffolk County

Total Acreage 37,452

	1974	1997	% Change
Land & Value			
Number of Farms	6	5	-16.7%
Farm Acreage	15	7	-53.3%
Farm / Total Acreage	0.04%	0.02%	-53.3%
Cropland	15	(D)	na
Market Value (in millions)	$ 0.5	$ 0.3	-47.0%
Direct Sales			
Number of Farms with Direct Sales*	na	1	na
Total Direct Sales (in thousands)*	(D)	0	na
Direct Sales per Farm*	(D)	0	na
Labor & Payroll			
Labor (workers)*	6	9	50.0%
Seasonal Labor (in thousands)	6	(D)	na
Payroll (in thousands)*	$ 33	(D)	na
Average Age of Farmer	41.0	57.3	39.8%

*1974 data unavailable. 1978 data used.

Farm numbers, acreage, and cropland drop.
Overall farm production dropped in Suffolk County, the home of Boston and its suburbs. The number of farms dropped from 6 to 5, and total farm acreage fell from 15 to 7 between 1974 and 1997. Five farms produced $263,000 in sales in 1997, which was a $233,000 decrease from 1974. Net cash returns from agricultural sales averaged $238 per farm in 1997, with 20 percent of farms experiencing net losses. Only one farm reported direct sales in 1997.

Major commodity group is nursery and greenhouse crops.
The only significant agricultural commodity group in Suffolk County was nursery and greenhouse crops. Total sales figures in this commodity group were not reported in 1997.

Farm labor numbers and payroll are small.
Hired farm labor was used on three farms in 1997, with a total of nine workers. Payroll totaled $26,000 in 1982, the last year for which payroll figures are available.

Average age of farmers increases, and fewer than half of farmers rely on off-farm incomes.
The average age of farmers increased by more than 16 years, from 41 in 1974 to 57.3 in 1997. Two out of five farmers had principal occupations other than farming.

Worcester County

Total Acreage 968,424

	1974	1997	% Change
Land & Value			
Number of Farms	816	984	20.6%
Farm Acreage	130,746	103,400	-20.9%
Farm / Total Acreage	13.5%	10.7%	-20.9%
Cropland	56,438	44,047	-22.0%
Market Value (in millions)	$ 32.3	$ 57.9	79.7%
Direct Sales			
Number of Farms with Direct Sales*	190	217	14.2%
Total Direct Sales (in thousands)*	$ 2,854	$ 4,725	65.6%
Direct Sales per Farm*	$ 15,021	$ 21,775	45.0%
Labor & Payroll			
Labor	3,101	1,825	-41.1%
Seasonal Labor (in thousands)	2,478	1,149	-53.6%
Payroll (in thousands)	$ 4,060	$ 9,187	126.3%
Average Age of Farmer	52.9	55.9	5.7%

*1974 data unavailable. 1978 data used.

Farm number increases, farmland and cropland decrease.

Worcester County experienced an increase in the number of farms, while losing land in farms and cropland between1974 and 1997. Farm numbers increased from 816 farms in 1974 to 1,191 in 1987, then declined to 984 in 1997 for an overall gain of only 168 farms. There was an initial increase in farmland from 130,746 acres in 1974 to 134,689 acres in 1987 but then a decline to 103,400 acres in 1997. Cropland initially increased from 56,438 acres in 1974 to 61,802 in 1987, then declined to 44,047 acres in 1997, for a loss of 12,391 acres.

Market value nearly doubles, more than half of farms experience net losses.

The market value of agricultural sales in Worcester County nearly doubled, from $32.3 million in 1974 to $57.9 million in 1997. Average agricultural sales per farm also increased, rising from $39,526 in 1974 to $58,891 in 1997. These significant increases are real when dollar values are adjusted for inflation with the Producers Price Index for agricultural goods. Net cash returns from agricultural sales averaged $13,984 per farm in Worcester County in 1997. Fifty-four percent of farms experienced net losses in 1997, a slight decrease from over 56 percent in 1987.

Major commodity groups include nursery and greenhouse crops and dairy products.

Agriculture remained diversified, with real losses in the livestock sector being compensated for by increases in crop production. The major commodity group was nursery and greenhouse crops, with $17.3 million in sales in 1997. This group's share of sales more than quadrupled, from 7 percent of total agricultural sales in 1974 to 30 percent in 1997. Dairy products declined in production by almost 50 percent, from 40 percent of total agricultural sales in 1978 to 22 percent in 1997. The number of dairy farms declined from 230 in 1978 to 85 in 1997.

The third commodity group, at 18 percent of the county's total agricultural sales, was poultry and poultry products. Poultry farm numbers rose from 73 in 1974 to 109 in 1987, then fell to 82 in 1997, for a net gain of nine farms.

Direct sales dollars increase significantly.

Direct sales increased, as did the number of farms employing them. The number of farms engaged in direct marketing of agricultural products increased from 190 in 1978 to 217 in 1997, a gain of 27 farms. Total direct sales rose from $2.9 million to $4.7 million. Average direct sales per farm utilizing direct marketing were $21,775 in 1997.

Farm labor numbers drop, payrolls more than double.

Hired farm labor was used on 271 farms in 1997. This accounted for 1,825 workers and $9.2 million in payroll, compared to 3,101 laborers earning $4.1 million in 1974. Most employees were seasonal, with 1,149 working fewer than 150 days.

Average age of farmers increases by three years; half of farmers rely on off-farm incomes.

The average age of farmers in Worcester County was 55.9 years in 1997, up from the 1974 average of 52.9. Fifty-one percent of Worcester County farmers had principal occupations other than farming in 1997, while only 39 percent were principally employed in off-farm occupations in 1974.

The State of Forestry in the Commonwealth

The USDA Forest Service conducts periodic inventories of forest health throughout the nation. The most recent data for Massachusetts were compiled for 1972, 1985 and 1998. Land use, land ownership, the volume of the growing stock, and estimates of timber harvest and forest growth were collected by species and county for the state. The results indicate a growing forest resource for Massachusetts.

The lumber and wood products industry, as measured by the U.S. Department of Commerce, is a fairly broad one. Total 1998 employment accounted for 4,110 individuals in Massachusetts. Logging is the primary resource phase of the industry.

The last year in which logging data were presented for Massachusetts was 1972. In that year, 26 establishments were listed with total employment of 375 people. Massachusetts Forest Stewardship now reports an estimated 500 licensed timber harvesters in the state. There is limited data available for these individuals; a majority are self-employed and are not captured by traditional U.S. Census efforts.

In addition to harvest of traditional timber products, Massachusetts hosts at least two significant non-timber forest products. Christmas trees and greens contribute $10 million to the state's economy. The maple syrup industry is estimated to provide an additional $3 million.

The Forest Service estimates that over 121 million board feet of sawtimber is harvested annually from our forests. Sawtimber is valued by stumpage prices, the fees paid to landowners for the right to harvest trees. In the third quarter of 1999, stumpage prices ranged from $47 to $312 per thousand board feet for the most popular species. This represents over $15 million dollars in timber sales annually in the state.

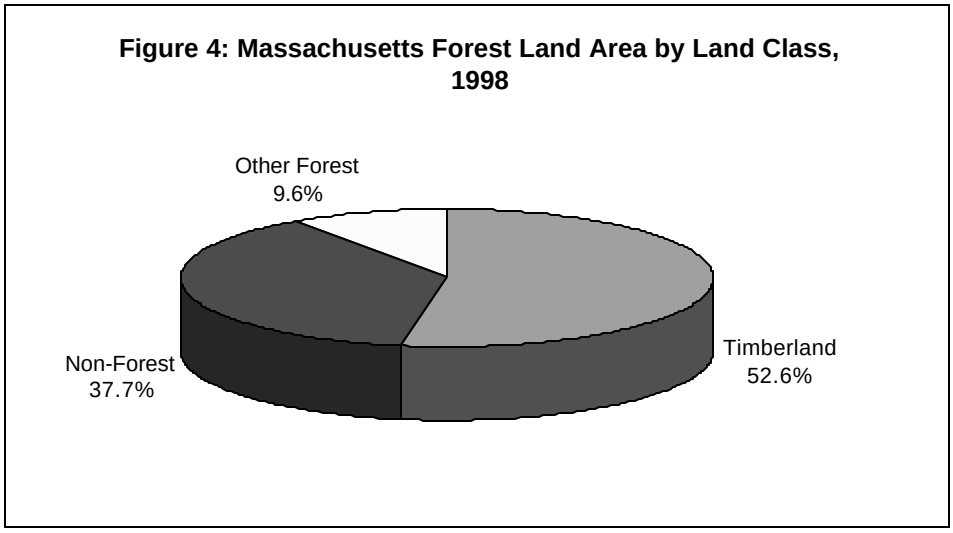
Massachusetts consumes more forest products than it produces. Present estimates peg production at less than 10 percent of the volume of forest products consumed. Ownership of the forested land has shifted from the private to the public sector in recent years.

Urban and suburban sprawl, particularly in the eastern half of the state, have reduced the area classified as timberland, which declined by 5.5 percent (155,000 acres) between 1972 and 1998. Despite this loss, the estimated volume of sawtimber growing in the state has increased by over 150 percent. This growth provides the Massachusetts forest products industry with an attractive resource base. Businesses that utilize this renewable resource stand poised for future growth.

Forest Land Use

According to 1998 Forest Service figures, the total Massachusetts land area is 5,016,000 acres. Timberland comprises 2,642,100 acres for 52.6 percent of the total acreage. An additional 9.6 percent is classified as other forest; non-commercial forestland that includes reserved lands, urban forest, and other forestlands. The remaining 37.7 percent of the commonwealth's total acreage is classified as non-forest land, including cropland, pasture and "other land uses."

Figure 4 Mass. Forest Land Area by Land Class



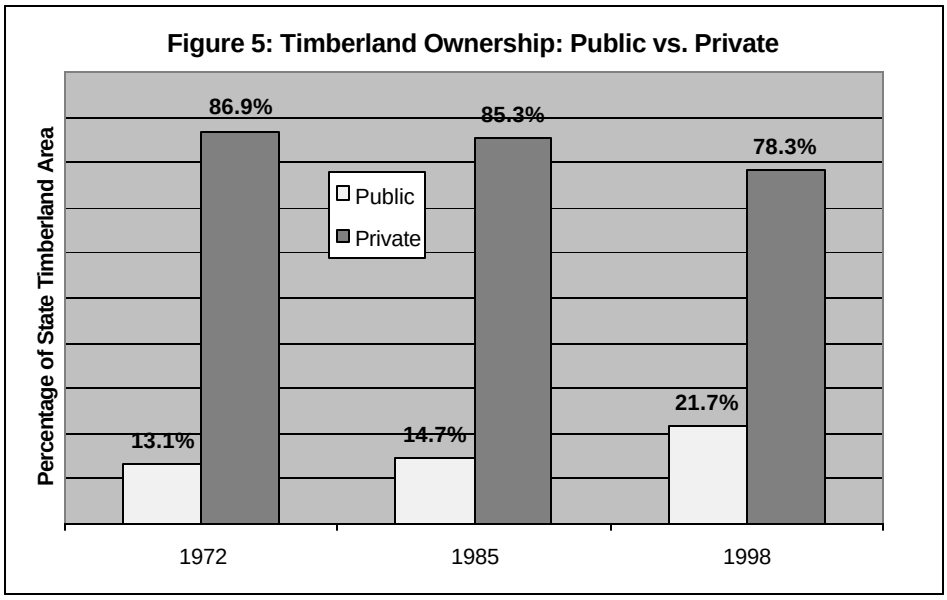
From the perspective of the forest products industry, the timberland base has remained fairly stable over the past 30 years. The acreage classified as timberland fell just 5.5 percent over that period. The timberland picture was a little more disturbing, however, when looking at changes from 1972 to 1985 and from 1985 to 1998. Between 1972 and 1985, timberland statewide actually increased by 4.7 percent, adding 131,000 acres. From 1985 to 1998, however, timberland dropped by 9.8 percent statewide, with 286,000 acres being lost to non-forest land and most likely to urban and suburban sprawl.

Who Owns Massachusetts Timberland?

The Forest Service broadly classifies timberland ownership as public and private. In 1972, 13.1 percent of the commonwealth's timberland was under public ownership and 86.9 percent was in private hands. There was a marked trend toward increased public ownership during the 1972-1998 period. By 1998, public ownership accounted for 21.7 percent of the total 2,642,100 acres of Massachusetts timberland; the remaining 78.3 percent was privately owned.

State timberland acreage declined by 155,000 acres between 1972 and 1998. Breaking this loss down by land ownership classes shows a reduction of 363,000 acres in private holdings, while publicly owned timberland increased by 208,000 acres. Most of this change occurred between 1985 and 1998. In fact, private and public timberland acreage increased during the 1972-1985 period by approximately 65,000 acres each. Private timberland acreage then fell by 430,000 acres between 1985 and 1998. During the same time period, public timberland holdings increased by 143,000 acres, a surprising 33.2 percent increase.

Figure 5 Timberland Ownership: Public vs. Private



Public timberland ownership is made up of federal, state, county and municipal holdings. Private timberlands include individual, farmer, corporate, forest industry, and "other" owned lands. Only the 1985 data provide such a complete breakdown of timberland ownership. In that year, public ownership accounted for 14.7 percent of the total 2,928,100 acres of Massachusetts timberland. Private ownership accounted for 85.3 percent. The state accounted for a majority of public holdings, with 297,000 acres, followed by counties and municipalities, with 116,000 acres and a small number for federal holdings. Individual owners accounted for 64 percent of the total private holdings, followed by farmers with 19 percent, "other" private owners with 7 percent, and corporate lands with 5 percent. Only 2 percent were classified as forest industry holdings.

The shift toward public timberland ownership has implications for employment in the forestry sector. Large public landholdings, such as the Metropolitan District Commission lands surrounding the Quabbin reservoir, are managed for a variety of purposes, including watershed services, wildlife habitat, recreation, aesthetics, and timber.

Timber is not the primary management objective on Quabbin lands. If the increase in public timberland holdings reflects a consolidation of smaller holdings, the ability to actively manage property for timber might be increased. There has been a trend toward increased fragmentation of forestland ownership in Massachusetts over the past 30 years. Decreasing parcel sizes typically corresponds with a drop in active forest management.

A Rapidly Growing Forest Resource

Forest Service data track both the total volume of growing stock and the volume of sawtimber. The growing-stock figures are calculated in millions of cubic feet, and the sawtimber statistics are presented in millions of board feet.[3] According to 1998 figures, the total volume of growing stock on timberland in Massachusetts was 5,722 million cubic feet. Softwoods made up 2,097 million cubic feet and hardwoods, 3,624 million cubic feet. The most significant softwoods were eastern white pine, with 64.2 percent, and eastern hemlock, with 28.5 percent of the softwood totals, respectively. Hardwood species were more diverse, with red maple accounting for 28.7 percent, northern and other red oaks with 27.4 percent, sugar maple with 6.6 percent, and white ash with 5.6 percent. All other hardwood species accounted for 31.8 percent of the hardwood growing stock.

The growing stock represents the potential of the forest products industry in Massachusetts. It grew significantly from 1972 to 1998. Total growing stock in 1972 was 3,393 million cubic feet.

The volume of growing stock increased by 2,329 million cubic feet between 1972 and 1998, an increase of 68.6 percent for all species. The hardwood stock grew by 70.5 percent, and the softwood stock grew by 65.5 percent. Species showing the fastest rate of growth include eastern hemlock, up 176.9 percent; white ash, up 151.7 percent; red maple, up 99.3 percent; all northern red oak, up 54.2 percent; and eastern white pine, up 53.5 percent. On a volume basis, red maple led the way with an increase of 518.4 million cubic feet between 1972 and 1998. White pine added 469 million, eastern hemlock 381.9 million, northern red oak 219.1 million, and white ash 121.8 million cubic feet, respectively.

With the advent of engineered wood products, which do not rely on large-diameter clear logs, this increase in growing stock represents a considerable opportunity. Oriented strand board, laminated strand lumber, and laminated veneer lumber are examples of engineered wood products that make use of chips or veneers. The significant increases in growing stock improve the potential to attract these types of wood processing businesses to the state.

Timber Volumes Growing as Well

Of more immediate interest to the traditional forest products industry is the availability of sawtimber trees. These are larger-diameter trees that can readily be turned into solid sawn lumber products. Solid sawn lumber products include structural lumber for the residential housing industry and finish-dimension lumber for trim, furniture, cabinetry, millwork, and secondary manufacture.

The 1998 figures showed Massachusetts with a total sawtimber volume of 16,531.1 million board feet. Softwoods made up 47.3 percent of the sawtimber total, and hardwoods, 52.7 percent. The most significant softwoods are eastern white pine, with 5,602.8 million board feet, and eastern hemlock, with 1,792.4 million board feet. Hardwood species were more diverse; northern and other red oaks made up 32.4 percent; red maple, 24.2 percent; sugar maple, 6.9 percent; black cherry, 6.5 percent; and white ash, 6.1 percent of the hardwood total. All other hardwood species accounted for 30.3 percent of the hardwood growing stock.

Figure 6: Softwood and hardwood sawtimber volumes

Figure 6: Softwood and Hardwood Sawtimber Volumes, 1972 and 1998

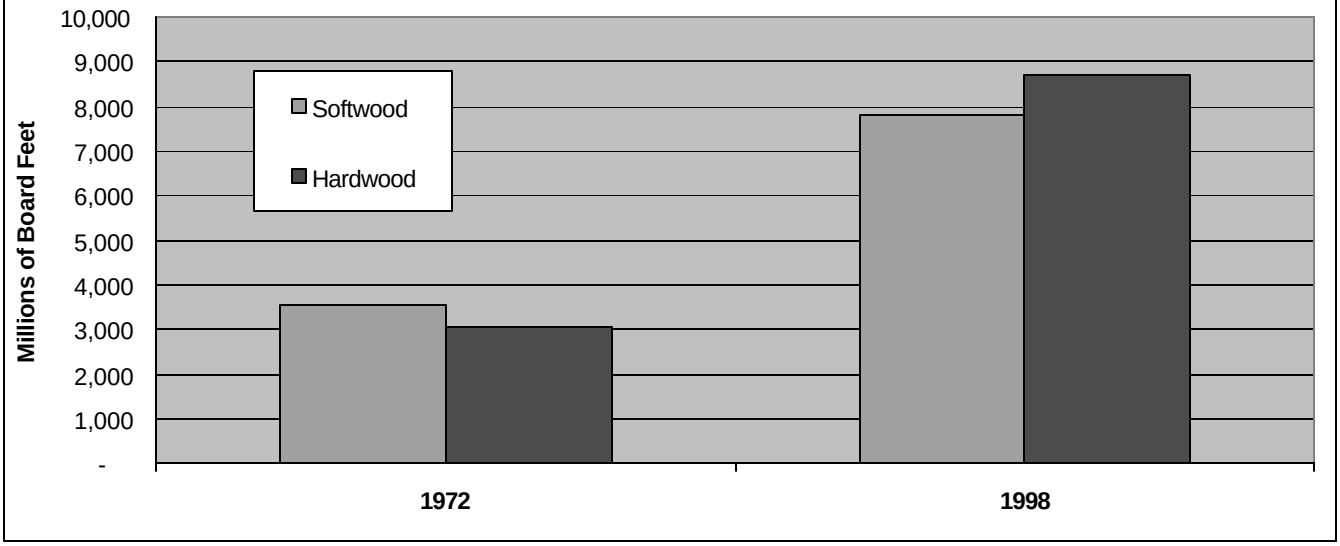
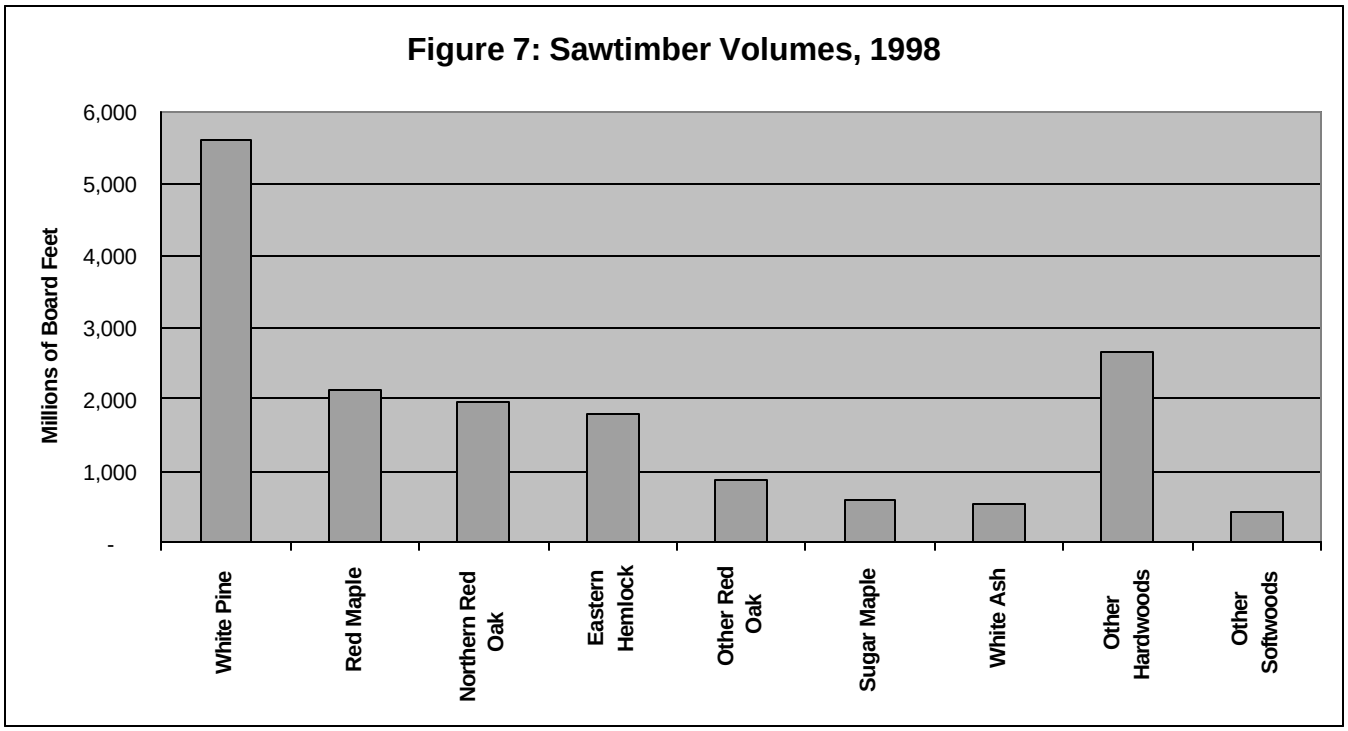
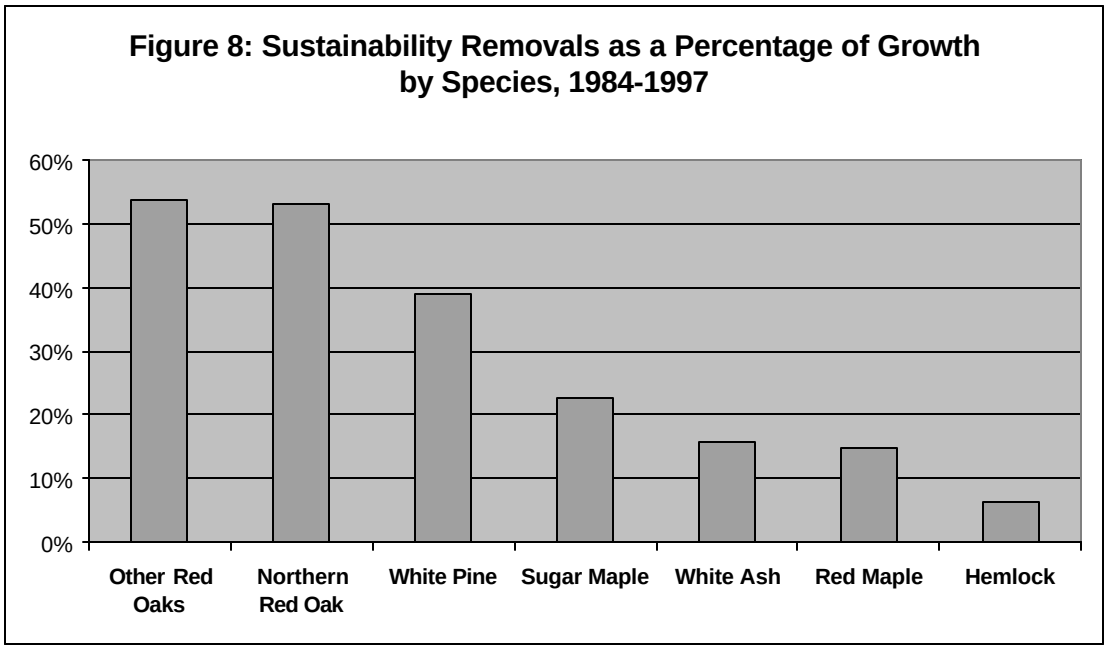


Figure 7 Sawtimber volumes



Sawtimber volumes for all of the major species grew considerably between 1972 and 1998. Total volume increased by 9,939.1 million board feet; a 150.8 percent increase over the 1972 volume. Hardwood sawtimber grew by 185.2 percent, and softwoods, by 121 percent. The largest gain was seen in white pine, which increased 2,979.1 million board feet. Red maple grew by 1,645.6 million board feet, eastern hemlock was up by 1,336 million board feet, and northern red oak grew by 1,125.8 million board feet.

Figure 8: Sustainability removals as a percentage of growth by species



The Forest Service also calculated annual net growth and removal estimates for Massachusetts tree species between 1984 and 1997. Overall, sawtimber volume has been increasing at a 1.7 percent annual rate. With the exception of red pine and yellow birch, all species have shown positive net growth after removals.

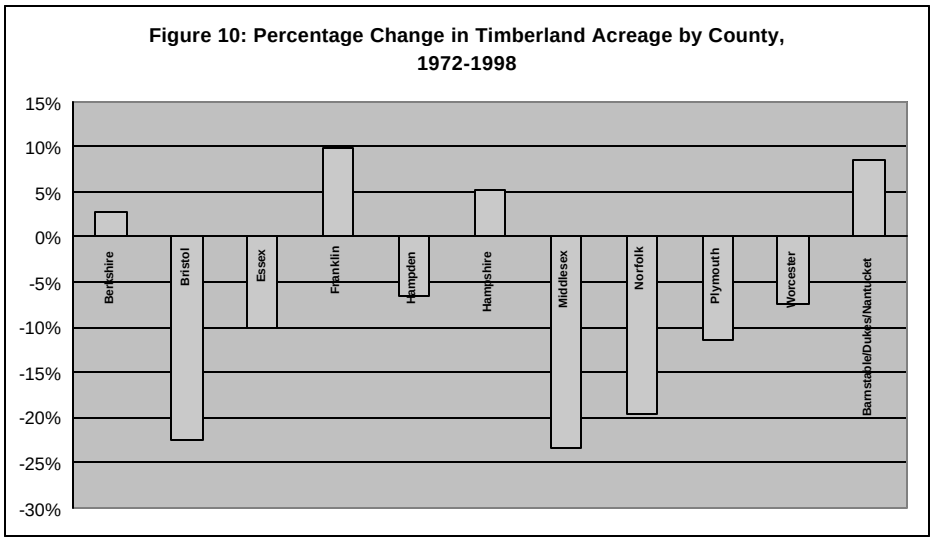
Annual net growth varies considerably by species. One measure that gauges sustainability of current rates of harvest is the ratio of annual removals to net growth before removals. On the whole, only 28.6 percent of the annual softwood sawtimber growth and 30.6 percent of hardwood sawtimber growth are being harvested in Massachusetts. Of the commercially important softwoods, eastern hemlock growth is outstripping harvest by a wide margin; removals amount to just 6.5 percent of annual growth. White pine removals are 39.1 percent of growth. For hardwoods, red maple (14.8 percent of growth), white ash (15.8 percent of growth), and sugar maple (22.5 percent of growth) are growing much faster than they are being harvested. The commercially important oaks are being harvested at a higher percentage of their annual growth, but still well below a constant stock level.[4] Significant growth in the timber resource provides the opportunity to raise harvest rates without reducing resource stock.

East-West Differences in the Forestry Sector

Massachusetts timberland is concentrated in the central and western counties of the state. According to 1998 estimates, the top five counties in timberland acreage are Worcester, Berkshire, Franklin, Hampshire, and Hampden. These counties comprise 1,851,000 acres (70 percent) of the state's total timberland. Worcester County remains the state's leading timberland county, with an estimated 593,000 acres in 1998, despite losing 7.2 percent of its timberland between 1985 and 1998. Franklin County added 32,000 acres, or 9.8 percent of its total, and Berkshire and Hampshire counties each added 12,000 acres between 1972 and 1998. Franklin and Hampshire counties had positive growth in both the 1972-85 and 1985-98 periods, while Berkshire County lost 1.7 percent of its timberland acreage in the latter period. Hampden County lost 12.5 percent of its timberland acreage between 1985 and 1998.

Total timberland in Massachusetts declined by 5.5 percent between 1972 and 1998. This represents 155,000 acres of timberland. The greatest timberland losses occurred in Middlesex, Worcester, and Bristol counties. Middlesex County lost 52,000 acres, representing 23.4 percent of its timberland. Worcester lost 47,800 acres, a decline of 7.5 percent from 1972 to 1998. Bristol County lost 22.5 percent of its timberland, a total of 42,000 acres.

Figure 10: Percentage change in timberland acreage



Timberland ownership is broadly classified as public or private, and in Massachusetts there has been an increase in public timberland while private timberland has declined. Public timberland ownership increased by more than 100 percent between 1972 and 1998 in Middlesex, Essex, Bristol, and Worcester counties and in the

combined counties of Barnstable, Dukes and Nantucket.

The largest public gains were in Berkshire County, where public timberland increased by 41,000 acres. Turning to changes in private timberland holdings, the biggest net losers of private timberland acreage were Middlesex (39.9 percent), Bristol (35.3 percent), Norfolk (25.3 percent), Essex (24.8 percent), and Barnstable/Dukes/Nantucket counties (19.2 percent). The largest acreage losses of private timberland occurred in Worcester (112,000), Middlesex (83,000), Bristol (61,000), Plymouth (37,000), and Berkshire (29,000).

When considering the state's significant softwood species, Worcester County accounts for the highest volume of white pine (29.8 percent), while Franklin County is home for 28.8 percent of the eastern hemlock. The largest volumes of both red maple and northern red oak are found in Worcester, Berkshire, and Franklin counties. These counties account for 53.9 percent of the total red maple stock and 73.6 percent of the red oak stock. Just over 90 percent of the state's sugar maples are found in Berkshire, Hampshire, Franklin, and Hampden counties. White ash are found primarily in Berkshire, Hampshire, and Worcester counties.

Increase in Growing Stock Concentrated in Three Counties

State-level estimates show that Massachusetts growing stock increased by 68.6 percent between 1972 and 1998. Worcester County accounted for 23.2 percent of the total growth, followed closely by Franklin (21.2 percent) and Berkshire (20.0 percent). Hampshire (11.8 percent) and Hampden (7.3 percent) also contributed significantly to the state's growing stock. These five counties accounted for 83.5 percent of the total increase in growing stock.

A COUNTY-BY-COUNTY LOOK AT THE FORESTRY NUMBERS

The commonwealth's counties contribute to different aspects of the forestry industry. Following is a summary of key data for each of the 13 counties. Additional data are provided in Appendix C.

Berkshire County

Berkshire County is the state's second most wooded county, with 483,000 acres classified as forest in 1998. Forested land increased by almost 12,000 acres between 1972 and 1998. Private landowners account for 68 percent of the s timberland, with the remaining 32 percent under public (municipal, state, or federal) ownership.

Berkshire County is home to 18.4 percent of the state's sawtimber volume. This amounts to more than three billion board feet of sawtimber trees, 66 percent of which are hardwoods and 34 percent, softwoods. Berkshire County has significant volumes of red maple, eastern hemlock, white pine, northern red oak, and white ash. Overall, timber volumes in Berkshire County grew by 143 percent between 1972 and 1998, representing significant potential for future timber harvests.

Bristol County

Bristol County had 193,000 acres of land classified as forest in 1998. Forested land area has decreased by more than 41,000 acres since 1972. This represents a 22.5 percent reduction in timberland. Private land owners account for 77.5 percent of the land classed as timberland. The remaining 22.5 percent is under public ownership. While forested land has decreased, Bristol County has also seen the third-highest growth rate in public timberland ownership. Public timberland has increased 155.9 percent since 1972, due to public land acquisition.

Bristol County has 2.9 percent of the state's sawtimber volume, representing over 481 million board feet of sawtimber trees. Hardwoods (52 percent) and softwoods (48 percent) are fairly evenly split. The most significant species in terms of volume include white pine, red maple, and northern red oak. Overall, timber volumes in Bristol County grew by only 7 percent between 1972 and 1998. This is the slowest growth rate of all counties, with the exception of Suffolk, and the combined counties of Barnstable, Dukes, and Nantucket.

Essex County

Essex County had 160,000 acres of land classified as forest in 1998. Forested land area decreased by more than 12,000 acres between 1972 and 1998. Private land owners accounted for 77 percent of the timberland, with the remaining 23 percent in public ownership. With public timberland increasing by 154.1 percent since 1972, Essex County has seen the fourth-highest growth rate in public timberland ownership.

Essex County is home to almost 700 million board feet of sawtimber trees, 4.2 percent of the state's sawtimber volume. Hardwoods constitute 44 percent of that total. Essex County has significant volumes of white pine, red maple, eastern hemlock, and northern red oak. Overall, timber volumes in Essex County grew by 227.5 percent between 1972 and 1998. This is the third-fastest growth rate among Massachusetts counties, and it represents significant potential for future timber harvests.

Franklin County

Franklin was the third most wooded county in Massachusetts, with 370,000 acres classified as forest in 1998. Forested land area has grown by more than 32,000 acres, the largest increase of all the commonwealth's counties since 1972. Private land owners account for 86 percent of the

land classified as timberland, the third-highest percentage of any county in Massachusetts. The remaining 14 percent is in public ownership.

Franklin County is home to 15.5 percent of the state's sawtimber volume, third among all counties in the state. This represents over 2.5 billion board feet of sawtimber trees, 55 percent of which are hardwoods. Significant volumes of white pine, eastern hemlock, northern red oak, red maple, and sugar maple exist in Franklin County. Overall, timber volumes in Franklin grew by 228 percent from 1972 to 1998, representing significant potential for future timber harvests.

Franklin County's most abundant timber species is white pine, with an estimated 584 million board feet in 1998. The second most abundant softwood is eastern hemlock, with 506 million board feet. Abundant hardwoods include northern red oak (382 million board-feet), red maple (300 million board-feet), and sweet birch (152 million board-feet). Applying recent median stumpage values gives a standing timber value in excess of $221 million for these five species alone. When stumpage prices are applied, red oak becomes the county's most valuable species at $134 million. The two softwoods, white pine ($46 million) and eastern hemlock ($18 million), follow in value.

Hampden County

Forested land area in Hampden County has fallen by over 15,000 acres since 1972. This is a result of significant growth and expansion of housing. However, Hampden County forests still represented 251,000 acres in 1998. Private land owners accounted for 77 percent of the timberland.

Hampden is home to 8.8 percent of the state's sawtimber volume. This accounts for almost 1.5 billion board feet of sawtimber trees, 65 percent of which are hardwoods. Hampden County has significant volumes of eastern hemlock, white pine, red maple, northern red oak, and sugar maple. Overall, timber volumes in the county grew by 137 percent between 1972 and 1998.

Hampden County's most abundant timber species is eastern hemlock, with an estimated 236 million board feet in 1998. White pine (235 million board feet) follows closely in abundance. Important hardwoods include red maple (165 million board feet), northern red oak (133 million board feet), and other red oaks (95 million board feet). Applying recent median stumpage values gives a standing timber value in excess of $96 million for these five species alone. Red oak leads the way with a value of $47 million. White pine adds another $18 million, and other red oaks are valued at $14 million.

Hampshire County

Hampshire County had 243,000 acres of forest in 1998. Forested land area grew by almost 12,000 acres after 1972. Private land owners account for the bulk of the timberland (86 percent), the second-highest percentage of any county in Massachusetts. The remaining 14 percent is publicly owned.

Hampshire County is home to 9.5 percent of the state's sawtimber volume, or over 1.5 billion board feet of sawtimber trees. The sawtimber stock is primarily hardwood (61 percent). Hampshire County has significant volumes of white pine, eastern hemlock, red maple, sugar maple, and northern red oak. Overall, timber volumes in Hampshire grew by 173 percent between 1972 and 1998, representing significant potential for future timber harvests.

Hampshire County's most abundant timber species is white pine, with an estimated 380 million board feet in 1998. White pine is followed by eastern hemlock (206 million board feet), red maple (171 million board feet), sugar maple (154 million board feet), northern red oak (104

million board feet), and black cherry (100 million board feet) in abundance. Applying recent median stumpage values gives a standing timber value in excess of $150 million for these five species alone. Hardwoods represent more than two-thirds of the stumpage value. Sugar maple is the leading species in value, at $39 million, followed by northern red oak ($36 million) and Black cherry ($30 million).

Middlesex County

Middlesex County had 236,000 acres of land classified as forest in 1998. Forested land area has decreased by over 52,000 acres since 1972, a 23.4 percent reduction in timberland. This reduction represents the greatest percentage loss of all counties in Massachusetts. Private land owners account for 72 percent of the land classed as timberland, with the remaining 28 percent in public ownership. Middlesex County has seen the highest growth rate in public timberland ownership. Public timberland has increased 179.4 percent since 1972, due to public land acquisition, and has moderated the overall loss of timberland.

Middlesex is home to 6 percent of the state's sawtimber volume. This amounts to just under one billion board feet of sawtimber trees. Thirty-eight percent are hardwoods. Middlesex County has significant volumes of white pine, red maple, and northern red oak. Overall, timber volumes in Middlesex County grew by 130 percent between 1972 and 1998, representing significant potential for future timber harvests.

Norfolk County

Norfolk County had 135,000 acres of land classified as forest in 1998. Forested land area decreased by over 21,000 acres since 1972, a 19.6 percent reduction. Private land owners account for 87 percent of the timberland. The remaining 13 percent is under public ownership.

Norfolk has 670 million board feet of sawtimber trees. The greatest portion is softwood (59 percent). This represents 4.1 percent of the state's volume. Norfolk County sawtimber is primarily white pine and red maple. Overall, timber volumes in Norfolk grew by 244.9 percent between 1972 and 1998. This is the fastest growth rate of any county in Massachusetts, and it represents significant potential for future timber harvests.

Plymouth County

Plymouth County had 254,000 acres forest in 1998. Forested land area had decreased by over 25,000 acres since 1972. Private land owners account for 85.5 percent of the timberland. The remaining 14.5 percent is in public (municipal, state, or federal) ownership.

Plymouth is home to 7.3 percent of the state's sawtimber volume. This accounts for over 1.2 billion board feet of sawtimber trees, 33 percent of which are hardwoods. Plymouth County has significant volumes of white pine and red maple. Overall, timber volumes in the county grew by 109 percent between 1972 and 1998, representing significant potential for future timber harvests.

Worcester County

Worcester County had 634,000 acres of land classified as forest in 1998, in spite of the fact that it decreased by more than 47,000 acres between 1972 and 1998. The county has more forest acreage than any other county in Massachusetts. Seventy-nine percent of Worcester County's timberland is owned by private landowners; the remaining 21 percent is publicly owned.

Worcester is home to 22.9 percent of the state's sawtimber volume, again the greatest volume of forest resources of all Massachusetts counties. This represents nearly 3.8 billion board feet of sawtimber, 47 percent of which is hardwood. Worcester County has significant volumes of white

pine, northern red oak, red maple, eastern hemlock, and white ash. Overall, timber volumes in Worcester grew by 177 percent between 1972 and 1998, representing significant potential for future timber harvests.

Endnotes

[1] Real dollars are nominal dollars deflated by the Producers Price Index for farm products: 1982=100. Authors' calculations used the Producers Price Index for farm products as published in Statistical Abstract of the United States.

[2] Though dollars are given in nominal terms, the trends are the same when adjusted for inflation by using the Producer Price Index for farm products.

[3] The Forest Service definition of growing-stock includes all trees with a diameter measured at breast height (dbh) greater than five inches. The sawtimber figures include only trees larger than nine inches dbh for softwoods and more than eleven inches dbh for hardwoods. These represent the typical tree that would be desired by sawmills for use in solid sawn lumber applications. A board foot of lumber is a piece of lumber 12" long by 12" wide, and 1" thick.

[4] Northern red oak harvests stand at 53.2 percent of growth while other red oak and white oak are 53.9 percent and 65.7 percent of growth, respectively.