

An Analysis of the Economic Dimensions of the New York State Greenhouse Industry



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New York State Flower Industries
New York State Department of Agriculture and Markets**

EXECUTIVE SUMMARY

The greenhouse industry is an important sector of New York State agriculture. This sector produces goods and services which enhance the quality of life in communities (ornamental plants) and those vital to food consumption (fruits and vegetables). It makes a substantial contribution to the New York economy. According to USDA, New York's greenhouse and nursery crop production industry is the state's second largest sector of agriculture (second only to dairy products) with a production sales value that reached \$258 million in 1997, including both greenhouse and open-ground production. There were 1,510 farms in New York reporting a total of 28.8 million square feet of crops produced in greenhouses in 1997. The counties with the largest areas of greenhouse space were Suffolk (32%), Erie (9%) and Orange (5%).

The objective of this report is to define the economic dimensions of the greenhouse industry in New York State. In fall 1998, New York State businesses were surveyed to determine the product sales and employment values and pest management practices in the state's greenhouse industry. Crops produced by the surveyed greenhouse operations included floriculture crops and vegetable crops, as well as other nursery and greenhouse crops. Survey results indicated that the industry sales varied significantly depending on the business size and market outlets. Total sales revenue from New York greenhouse production was estimated to be \$206.8 million during 1997. The average sales value of New York businesses from greenhouse crops was \$413,844, and the average greenhouse area was 37, 834 square feet. Over 71% of the industry revenue was generated by firms with \$500,000 or more annual greenhouse product sales.

Although New York greenhouse businesses sold to retail and wholesale customers inside and outside of the state, about 60% of total sales were to businesses and residents in the state. Retail was the most common marketing channel for the majority of greenhouse businesses (79%). Wholesale to mass marketers was the marketing channel that generated the highest sales – 45% of total industry sales – and used by 10% of the greenhouse businesses. Over 80% of the New York greenhouse operations carried bedding/garden plants in their product lines, and the sale of bedding and garden plants contributed the largest share (51%) to total industry sales. This was followed by sales of flowering potted plants (32.7%). New York producers generated an average total of \$10.9 per square foot greenhouse space from crop production in 1997.

In addition, the industry directly employed about 7,500 individuals during 1997. The initial contribution of the state's greenhouse industry was estimated to be 4,385 full-time equivalent (FTE) jobs and \$67.5 million in payroll. Using the IMPLAN input-output model for New York State, the total (initial plus indirect and induced) output and employment were estimated to be about \$321 million and 5,850 FTE jobs. Output and employment multipliers for the greenhouse firms were estimated to be 1.552 for output and 1.334 for employment. Thus, for every dollar of income generated and every job created by the New York greenhouse industry, an additional \$0.55 and 0.33 jobs were created throughout the state's economy.

Finally, most of the New York greenhouse producers practiced some level of integrated pest management (IPM). More than 60% of growers scouted regularly, maintained scouting records, and applied insect control measures based on scouting reports.

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INTRODUCTION

The greenhouse industry is an important sector of New York State agriculture. This sector produces goods and services which enhance the quality of life in communities (ornamental plants) as well as those vital to food consumption (fruits and vegetables). It makes a substantial contribution to the New York economy. According to USDA reports, New York's greenhouse and nursery crop production industry is the state's second largest sector of agriculture (second only to dairy products) with a production sales value reaching \$258 million in 1997.¹ It is a growing industry. Cash receipts for floriculture crops, the major crop category produced in greenhouses, reached \$177.8 million in 1997, a 38% increase from \$128.8 million in 1992.² In 1997, New York growers reported that the total square footage of crops produced under glass or other protection was 28.8 million square feet, compared to just under 25 million square feet in 1992. Furthermore, this industry provides a continuing stream of job opportunities and incomes to the local economies. Purchase of products and services from one of these businesses injects new money into local economies and thus stimulates additional spending by local businesses and households. In addition, the industry's economic impact on the state economy is multiplied by the fact that it also serves as a purchaser of goods and services from other business sectors.

While the development potential of high-value greenhouse production is recognized by many sectors in the state, accurate data on the economic dimensions of New York State's greenhouse industry have been unavailable for businesses, researchers, and government officials to use for planning and evaluation purposes. The overall goal of this study is to establish economic measures and production scope of the greenhouse industry in New York State and its impact on the state economy in 1997 values. The information collected included production and sales, employment and wages, imports and exports of plant materials, and integrated pest management (IPM) practices applied in the industry. This paper reviews census data related to the greenhouse industry, and presents a discussion of survey and data collection methodology, survey results for different size business classes and specified product categories, and the secondary economic impacts associated with the New York greenhouse industry.

¹ Greenhouse and nursery crops include bedding/garden plants (annuals, herbaceous perennials, and vegetable plants); bulbs, corms, rhizomes and dry tubers; cut flowers and cut florist greens; foliage plants; potted flowering plants; greenhouse produced vegetables; nursery crops (ornamentals, shrubs, fruit and nut trees and vines); and other nursery and greenhouse crops (USDA, 1997 Census of Agriculture).

² Floriculture crops include bedding/garden plants, cut flowers and cut florist greens, foliage plants and potted flowering plants.

MATERIALS AND METHODS

The first part of this research was carried out by reviewing available secondary data on the scope of the New York State greenhouse industry. In addition, a survey was developed to gather information from the New York greenhouse production industry on business characteristics, employment (full-time, part-time, year-round and seasonal), and IPM practices (See Appendix). In Fall of 1998, a four-page questionnaire was designed by the Cornell Greenhouse and Controlled Environment Agriculture (GCEA) Program and mailed by New York State Department of Agriculture and Markets, the Division of Plant Industry to all registered plant growers. The success of the study depended on the support of the industry. Letters of endorsement from the chairmen of the Cornell GCEA Program and its Advisory Board, as well as the president of New York State Flower Industries were mailed to the growers with the survey. Industry associations and leaders, and county cooperative extension offices encouraged growers to complete the survey through newsletters, meetings and personal contacts.

Producers of greenhouse crops were asked to include in their estimates only the value of products grown in greenhouses. Crops produced on open ground by these operations were not included. Businesses were classified into six categories based on annual sales of greenhouse products – less than \$10,000; \$10,000 to 39,999; \$40,000 to 99,999; \$100,000 to 199,999; \$200,000 to 499,999; and \$500,000 or more. The values of sales, employment, and payroll were analyzed for each business class. Crop production was categorized into eight groups: bedding/garden plants (including annuals, herbaceous perennials, vegetable plants), potted flowering plants, foliage plants, cut flowers and cultivated greens, greenhouse vegetables, prefinished plants, propagative materials (including plugs, cuttings, seeds, bulbs, corms, rhizomes, and tubers), and other nursery and greenhouse crops (including nursery crops and other crops produced in greenhouses). Production values and areas for each crop category were summarized.

In order to extrapolate the aggregate industry production value from the survey data, two of the crop categories stated above, “prefinished plants” and “propagative materials,” were combined into “other nursery & greenhouse crops” for a total of six categories. This was done in order to coordinate with the crop categories used in the nursery and greenhouse crop section in the 1997 Census of Agriculture. The two terms – greenhouse production area and production area under glass or other protection – are used interchangeably in this report. The average of unit sales values (revenue per square foot of greenhouse area) for each of the six crop categories was estimated from the survey results and multiplied by the total greenhouse production area for each category in the state as determined in the census report. The summation of the six crop category totals provided the aggregate production value for the industry. Averages per square foot of greenhouse area for employment and payroll were evaluated and multiplied by total greenhouse square footage in the industry to obtain an aggregate figure for each. It was assumed that nonrespondents had characteristics similar to respondents.

Finally, the secondary economic impacts associated with the greenhouse industry were estimated using a state-level input-output model (IMPLAN³). The economic multiplier summarizes the cumulative (initial/direct, indirect, and induced) effect of an initial change in final demand plus the resulting series of successive rounds of spending within the local economy. The direct effect is the initial outcome generated by the greenhouse businesses. The indirect effects are caused by increased purchases by firms that provide goods and services to the greenhouse industry. The induced effects are the result of added spending on consumer goods by all regional employees that receive added income, directly or indirectly, from the greenhouse industry.

RESULTS

Industry Overview

According to the 1997 Census of Agriculture, New York's greenhouse and nursery crop production industry had a total of \$258 million sales value, including both under-cover and open-ground production, excluding Christmas trees and sod production. The value of New York greenhouse and nursery crop production ranked tenth in the United States. Greenhouses are used to grow and market the following plant categories: bedding/garden plants, potted flowering plants, cut flowers, cut florist greens, foliage plants, vegetables, nursery crops, propagative materials (seeds, cuttings, plugs, bulbs, corms, rhizomes and tubers), and other nursery and greenhouse crops. There were 1,510 firms in New York reporting a total of 28.8 million square feet of crop production under glass or other protection in 1997, compared to 1,346 firms with just under 25 million square feet of crops produced under cover in 1992. The counties with the largest share of greenhouse area were Suffolk (32%), Erie (9%), and Orange (5%). Figure 1 shows the distribution of firms with greenhouse production in New York State.

Cash receipts for floriculture crop production, the major crop category produced in greenhouses, reached \$177.8 million in 1997, a 38.5% increase from \$128.8 million in 1992. The impact of these dollars was widely distributed across the economy of the state with the majority of this impact going to the more heavily populated areas (Figure 2). There were 1,346 firms producing a total of 25.9 million square feet of floriculture crops under greenhouse protection in 1997, increased from 1,164 firms and 22.3 million square feet of greenhouse production in 1992. New York floriculture crop production ranked seventh among the states in 1997 and sixth in 1998 according to the 1997 Census of Agriculture and the 1998 New York Agriculture Statistics reports. Between 1992 and 1997, operations producing bedding/garden plants have increased both in numbers and sales value, operations producing foliage plants and potted flowering plants have decreased in numbers but increased in sales values, and finally, operations producing cut flowers and greens have decreased both in numbers and sales values (Table 1).

³ IMPLAN (IMpact analysis for PLANning) is a microcomputer program that performs regional input-output analyses. The model can be defined for any region in the United States based on national data and coefficients developed by the US Department of Commerce. IMPLAN was developed by Minnesota IMPLAN Group at St. Paul, Minnesota.

Table 1. Firm Numbers and Production Sales Values of Floriculture Crops in New York, 1992 and 1997, by Crop Category

Crop Category	Number of Firms		Sales Value (\$1,000)	
	1992	1997	1992	1997
Bedding/garden plants	1,016	1,217	\$57,958	\$107,500
Potted flowering plants	406	380	52,420	53,006
Foliage plants	142	138	4,437	6,976
Cut flowers and greens	105	79	13,989	10,280
Total	1,164	1,346	128,803	177,763

Source: USDA, 1997 Census of Agriculture – State Data

According to the USDA 1997 Census of Agriculture, New York producers also reported growth in other greenhouse production categories. In 1997, a total of 612,688 square feet of vegetables were produced in greenhouses by 120 firms with a total production value of \$3.5 million. This is more than double the total greenhouse vegetable production value of \$1.6 million in 1992, which was produced by 86 firms in 478,979 square feet of greenhouse area. A total production value of \$8.1 million was generated by 1,195 firms producing crops in the category of “other nursery and greenhouse crops” with 793,446 square feet of greenhouse area and 26,529 acres of open-ground production in 1997. This is a dramatic increase from 46 firms which produced \$550,000 of this crop category under 56,997 square feet of greenhouses and 33 acres open-ground production area in 1992. Some examples of crops under this category include unfinished plants and propagative materials (plugs and cuttings). In addition, 38 firms produced \$1.25 million of bulbs, corms, rhizomes and tubers in 305,800 square feet of greenhouse area and 44 acres in open-ground in 1997. However, New York growers reported decreases in the number of firms, production area and total sales for vegetable and flower seed production between 1992 and 1997.

Survey Respondent Profile

There were 508 New York firms involving in the production and sale of greenhouse crops in 1997 responded to the greenhouse industry survey conducted by the Cornell GCEA program, represented \$147.8 million in annual sales. USDA data showed that 1,510 firms reported production under glass or other protection in 1997; this was a response rate of 33.6%. The operations participating in the survey represent a vast array of business configurations and sizes. It is important to note that the sample of respondents is representative and sufficient to demonstrate the industry structure (Table 2).

The survey results showed that the 1997 New York industry averages of annual greenhouse product sales and the greenhouse production area were \$413,844 and 37,884

square feet, respectively. Tables 3 and 4 show the average annual greenhouse sales and greenhouse production area by business size from the survey results. The business class of \$500,000 or more annual greenhouse product sales had the highest variation of sales values and production area.

Table 2. Survey Respondent Profile Compared to State Census, by Business Size

Business Class by Sales	Survey ^a		Operations with Greenhouse Production in the State ^b	
	Number of Respondents	% of Respondents	Number of Firms	% of Firms
Less than \$10,000	154	30 %	434	29%
\$10,000 to \$39,999	115	23	430	28
\$40,000 to \$99,999	85	17	289	19
\$100,000 to \$199,999	57	11	181	12
\$200,000 to \$499,999	52	10	110	7
\$500,000 or more	45	9	66	4
Total	508	100	1,510	100

^a Respondents were classified by the annual sales value of greenhouse products.

^b Nursery and greenhouse operations reported crop production under glass or other protection by total value of sales as identified in USDA 1997 Census of Agriculture – New York State data.

Table 3. Average Annual Greenhouse Product Sales, by Business Size

Business Class by Sales	Average Sales (\$)	Standard Deviation (\$)	Coefficient of Variation ^a (%)
Less than \$10,000	4,807.7	417.6	8.69
\$10,000 to \$39,999	23,059.3	890.0	3.86
\$40,000 to \$99,999	61,408.7	2,242.9	3.65
\$100,000 to \$199,999	136,301.5	4,248.0	3.12
\$200,000 to \$499,999	304,373.2	16,682.8	5.48
\$500,000 or more	2,966,744.8	1,030,361.0	34.73
Total	413,844.1	126,539.6	30.57

^a Coefficient of variation expresses the variation of sample values relative to the sample average and is calculated by “standard deviation divided by sample mean”.

Table 4. Average Greenhouse Production Area, by Business Size

Business Class by Sales	Average Greenhouse Production Area (square feet)	Standard Deviation (square feet)	Coefficient of Variation ^a (%)
Less than \$10,000	2,257.7	330.7	14.6
\$10,000 to \$39,999	5,426.1	354.0	6.5
\$40,000 to \$99,999	10,883.7	721.0	6.6
\$100,000 to \$199,999	34,346.7	15095.4	44.0
\$200,000 to \$499,999	32,300.0	3621.4	11.2
\$500,000 or more	212,115.1	73,214.0	34.5
Total	37,883.6	9,774	25.8

^a Coefficient of variation expresses the variation of sample values relative to the sample average and is calculated by “standard deviation divided by sample mean”.

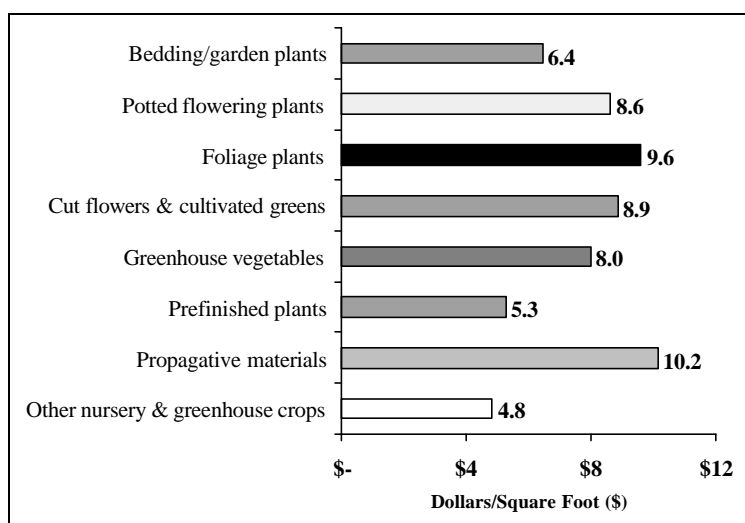
Product Lines and Production Values

The survey results showed that New York businesses produced a wide variety of greenhouse crops. Greenhouse products are divided into eight categories in this study: bedding/garden plants,⁴ potted flowering plants,⁵ foliage plants, cut flowers and cultivated greens, prefinished plants, propagative materials, greenhouse vegetables, and other nursery and greenhouse crops. Based on survey responses, the highest average sales value per square foot of greenhouse space was generated by propagative materials (\$10.2/ft²), followed by potted foliage plants (\$9.6/ft²), cut flowers and cultivated greens (\$8.9/ft²), and potted flowering plants (\$8.6/ft²) (Figure 3). These sales revenue figures were calculated without taking into consideration the different length of production times for crops. In order to determine the true revenue related to the various product lines, the value of sales per square foot needs to be converted for the weeks of greenhouse floor space occupied by each crop and expressed as dollars per square foot-week. Overall, New York greenhouse production businesses had an average annual production sales revenue of \$10.9 per square foot greenhouse space. This value is larger than the sales value per square foot for any individual product line except propagative materials because growers generally used the same greenhouse space to produce more than one crop cycle throughout the year.

⁴ Herbaceous perennials were included in the bedding/garden plant.

⁵ Potted bulbs were included in the flowering potted plants.

Figure 3. Unit Sales Value, by Product Line



To estimate the total industry production value, the unit sales values for the six crop categories correlated with the 1997 Census of Agriculture were calculated. According to USDA reports, New York produced a total of 28.8 million square feet of crops under greenhouses during 1997. The largest greenhouse production area was used to produce bedding/garden plants and potted flowering plants. Table 5 shows the average unit sales value for each crop category from survey results after combining prefinished plants and propagative materials into the “other nursery & greenhouse crops” category and the correlated greenhouse production areas for the six crop categories as determined in the 1997 Census of Agriculture report. The total revenue generated by the New York State greenhouse industry was estimated to be \$206.8 million, and the total area of greenhouse structures in the state was estimated at about 19 million square feet. The total greenhouse area is less than the total square footage of crops produced under greenhouses (28.8 million square feet) in the state because some greenhouse area was used to produce more than one crop cycle during the year.

Table 5. Average Unit Sales Value and Greenhouse Production Area, by Crop Category

Crop Category	Average Unit Sales Value ^a (\$/square foot)	Greenhouse Production Area ^b (1,000 square feet)
Bedding/garden plants	6.43	16,596
Potted flowering plants	9.63	6,819
Foliage plants	9.61	1,257
Cut flowers and greens	8.87	1,184
Greenhouse vegetables	7.98	613
Other Nursery & Greenhouse Crops ^c	6.27	2,198
Total	10.92	18,978 ^d

^a Average sales value per square foot of greenhouse space as calculated from the Cornell survey results.

^b Production area under glass or other protection as determined in 1997 Census of Agriculture.

^c Including prefinished plants, propagative materials, nursery crops, mushrooms, and other crops.

^d The total greenhouse area in the state was estimated by total revenue from greenhouse products divided by the total average unit sales value.

The volume produced by New York growers varied significantly among product lines (Table 6). Sales of bedding/garden plants and potted flowering plants made up 84% of the total revenue generating potential on a product basis. Bedding/garden plants constituted the most important product line for the New York greenhouse industry. They were handled by 81% of the greenhouse operations and generated more than half of the total industry sales (51%). The second largest revenue-generating product line is potted flowering plants, which was handled by 42% of the growers and generated 33% of the total industry sales. According to the survey, among the 28.8 million square feet of crops produced under glass or other protection, more than half (54%) were used to produce bedding/garden plants, and another 25% were used to produce potted flowering plants.

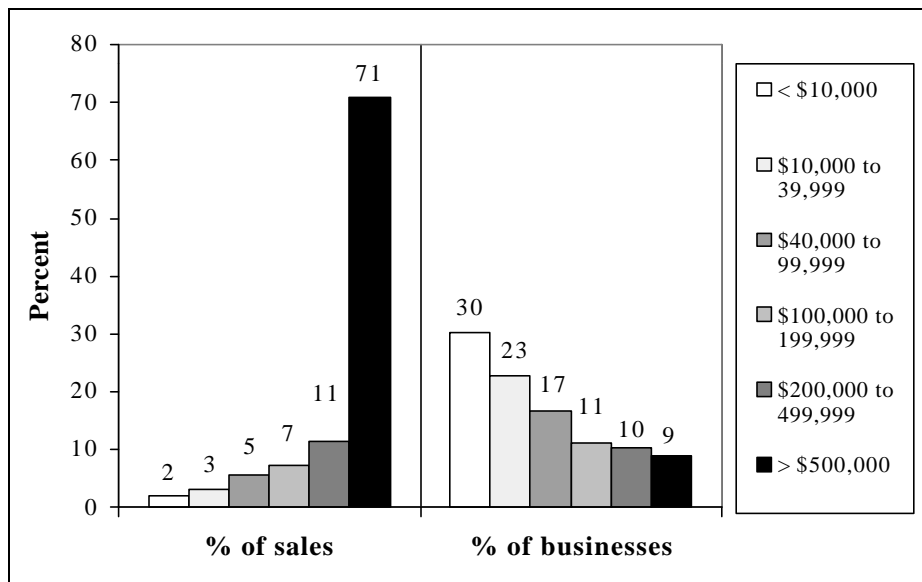
Table 6. Growers' Reported Production, Sales Value, and Production Area, by Product Line

Crop Category	<u>% of Businesses</u>	<u>Product Sales</u>		<u>Crop Production Area under</u>	
	<u>Reporting Production</u>	<u>Sales Value</u>	<u>% of Sales</u>	<u>Production Area</u>	<u>% of Area</u>
	(%)	(\$1,000)	(%)	(1,000 ft ²)	(%)
Bedding/garden plants	81	105,308.3	50.9	15,594.0	54.1
Potted flowering plants	42	67,725.5	32.7	7,138.0	24.8
Foliage plants	15	8,690.9	4.2	745.3	2.6
Cut flowers & cultivated greens	7	5,338.6	2.6	602.0	2.1
Greenhouse vegetables	6	5,708.8	2.8	716.7	2.5
Prefinished plants	7	5,265.1	2.5	1,003.3	3.5
Propagative materials	9	7,683.7	3.7	774.0	2.7
Other nursery & greenhouse crops	3	1,140.6	0.6	2,264.7	7.9
Total^a		206,861.5	100	28,838.1	100

^a Sum of growers reported production does not equal to 100% because some produced more than one crop categories.

The survey results showed that sales levels generated by firms varied significantly between business classes (Figure 4). The differences in sales levels indicate the relative contribution of each segment to the industry's overall economic impact on the New York State economy. The top 20% businesses (\$200,000 to 499,999 and more than \$50,000 annual greenhouse product sales) in the state generated more than 80% of the total industry sales. While a large portion of businesses was categorized in the classes of less than \$10,000 (30%) and between \$10,000 to 39,000 (23%) of annual greenhouse product sales, these two categories reported only 5% of the total sales volume in the industry. Although only 9% of the firms were categorized in the largest greenhouse business class of \$500,000 or more in annual sales, they reported 71% of the sales volume of the industry.

Figure 4. Percent of Sales and Businesses in the Greenhouse Industry, by Business Size



Marketing Channels

Various marketing channels are used by New York greenhouse businesses. The respondents identified the marketing channels they used to generate sales including wholesale to florists, garden centers, mass marketers, other growers, landscapers and brokers, retail, and sales to nonprofit organizations. Table 7 shows the marketing channels used by New York greenhouse businesses and the sales revenue generated through each marketing channel as estimated from the survey results. Direct sale to consumers was the most common marketing method used by New York greenhouse businesses. Seventy-nine percent of greenhouse operations merchandised their products through retail, followed by 39% wholesale to garden centers. Nonetheless, the highest volume of industry sales was from wholesale to mass marketers (45%), conducted by only 10% of the operations in the industry. The next highest sales value was generated by wholesale to garden centers (21%), followed by retail sales (13%).

Table 7. Marketing Channels Used by the New York Greenhouse Industry and Sales Values

Marketing Channel	<u>% of Businesses</u>	<u>Sales Value</u>	
	<u>Reporting</u>	Sales Value (\$1,000)	% of Sales Value
	(%)		
Wholesale to mass marketers	10	92,893.0	44.9
Wholesale to garden centers	39	44,330.1	21.4
Retail	79	25,897.1	12.5
Wholesale to florist	19	23,634.1	11.4
Wholesale to other growers	23	15,276.0	7.4
Wholesale to landscapers	6	2,925.6	1.4
Wholesale to brokers	1	1,019.7	0.5
Sale to non-profit organizations	3	885.9	0.4
Total ^a		206,861.5	100

^a Sum of growers' responses for using the marketing channels does not equal to 100% because some growers utilized more than one channels.

According to the Cornell survey, businesses of different sizes managed marketing channels differently to generate sales (Table 8). Except for the largest size operations with more than \$500,000 annual greenhouse sales, retail was utilized by most of the operations and generated the highest volume of sales, followed by wholesale to garden centers. Generally, the smaller size operations depended more on retail sales to generate revenue. However, for the business category of \$100,000 to 199,999 sales, while retail sales still generated the highest sale volume of 39% of the total sales, wholesale to garden centers was a close second which generated 37% of the total revenue from greenhouse products in 1997.

A reliance on wholesale marketing was more likely as firm size increased. For the business class with highest greenhouse production sales (\$500,000 or more), wholesale to garden centers was utilized by the most operations (86%), followed by wholesale to florists (65%) and wholesale to other growers (53%). Nonetheless, more than half of the sales volume was generated by wholesale to mass marketers (53%), followed by wholesale to garden centers (20%). Direct retail sales were less important for this group (5%).

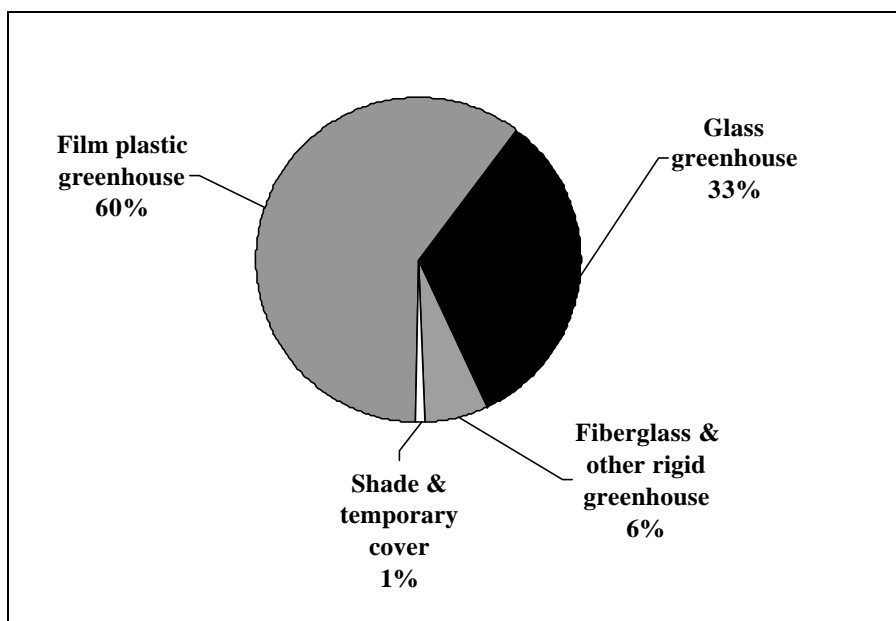
Table 8. Marketing Channels Used by the New York Greenhouse Industry and Sales Values, by Business Size

Marketing Channel	<u>Annual Greenhouse Product Sales</u>					
	<\$10,000	\$10,000 to 39,000	\$40,000 to 99,999	\$100,000 to 199,999	\$200,000 to 499,999	> \$500,000
<u>Marketing Channels Used by the Industry</u>						
	Percent of growers (%)					
Retail	91	93	83	61	89	44
Wholesale to garden centers	15	30	39	59	50	86
Wholesale to florists	5	8	16	27	28	65
Wholesale to other growers	4	21	17	34	25	53
Wholesale to mass marketers	0	8	10	10	8	35
Wholesale to landscapers	2	4	7	15	4	12
Wholesale to brokers	0	0	2	5	5	10
Sales to non-profit organizations	4	1	3	2	3	12
<u>Value of Greenhouse Products Sales through Each Marketing Channel</u>						
	Percent of sales (%)					
Retail	85.0	77.3	59.0	39.3	61.3	5.4
Wholesale to garden centers	10.0	12.8	23.9	36.8	25.2	20.4
Wholesale to florists	2.2	2.0	3.5	6.1	6.1	11.1
Wholesale to other growers	1.8	2.9	6.8	6.5	4.2	8.0
Wholesale to mass marketers	0	3.9	3.8	7.7	2.0	52.7
Wholesale to landscapers	0.2	0.8	2.0	3.0	0.3	1.2
Wholesale to brokers	0	0	0.3	0.4	0.4	0.8
Sales to non-profit organizations	0.8	0.3	0.7	0.2	0.5	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Greenhouse Production Structures

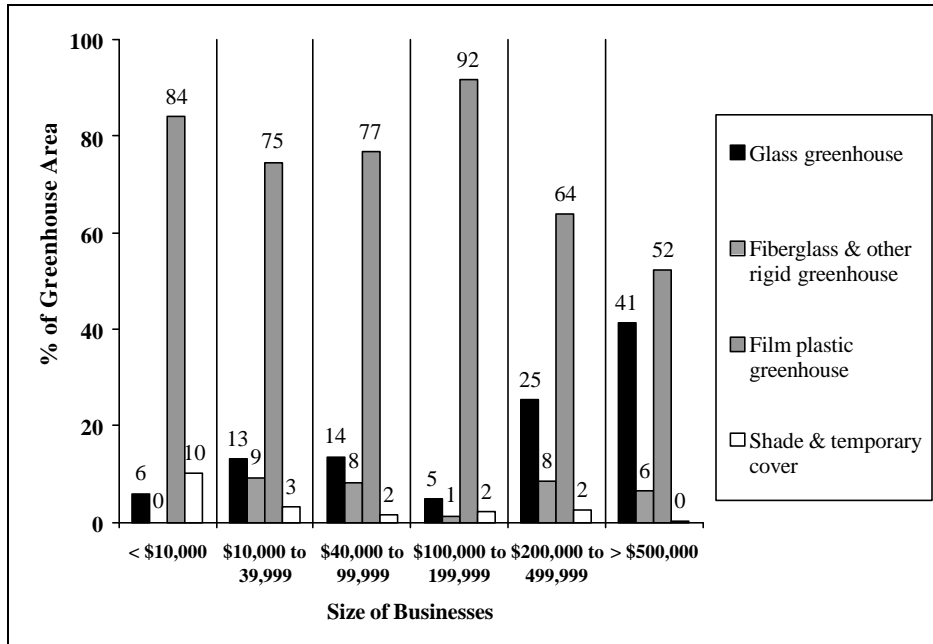
This study divided types of greenhouse structures into four categories: glass greenhouses, fiberglass & other rigid greenhouses, film plastic greenhouses, and shade & temporary covered area. As estimated in the previous section, the total area of greenhouse production structures in New York was about 19 million square feet in 1997. The survey results showed that the most commonly used greenhouse structure in New York was film plastic greenhouses, representing 60% of the total covered production area in New York. This was followed by glass greenhouses (33%) (Figure 5).

Figure 5. Percent of Total Greenhouse Area, by Type of Cover



While film plastic was the most commonly used greenhouse cover material by all sizes of greenhouse operations, different sizes of operations were likely to select different types of greenhouse covers (Figure 6). Large producers (\$500,000 or more in annual greenhouse sales) were most likely to choose glass greenhouse structure (52% of the greenhouse production area) and least likely to use temporary structure film plastic greenhouses (0%) among different size operations. Medium-sized operations with annual greenhouse sales between \$100,000 and 199,999 were most likely to choose plastic film for their greenhouse cover (92% of the greenhouse production area) and least likely to invest in more permanent glass (5%) and fiberglass/other rigid material (1%). The smallest greenhouse operations (\$10,000 or less annual sales) were more likely to use shade and temporary cover for production (10% of the greenhouse production area) than other groups.

Figure 6. Type of Greenhouse Structure, by Business Size



Selling and Buying Patterns

New York operations sell their greenhouse crops both within and outside the state. Sales of greenhouse products by New York businesses were primarily to in-state customers. Ninety-one percent of the surveyed firms were involved in sales to New York State buyers, and the sales value accounted for 60% of total industry revenue from greenhouse products. Another 40% of the industry sales were to customers outside of New York by 26% of the firms. Only 2% of the firms in the industry exported their crops outside the United States, with a total sales volume of less than 0.5% of industry revenue from greenhouse product sales (Figure 7). The majority of firms sold to in-state customers regardless of size. However, larger size firms were more likely to sell to out-of-state customers (Figure 8).

Figure 7. Businesses Reporting Sales and Value of Product Sold, by Customer Source

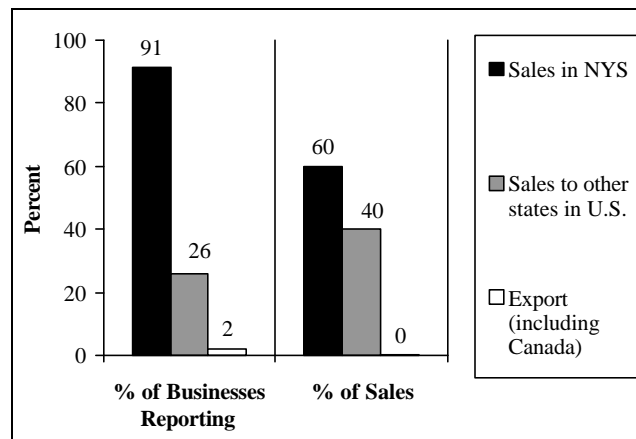
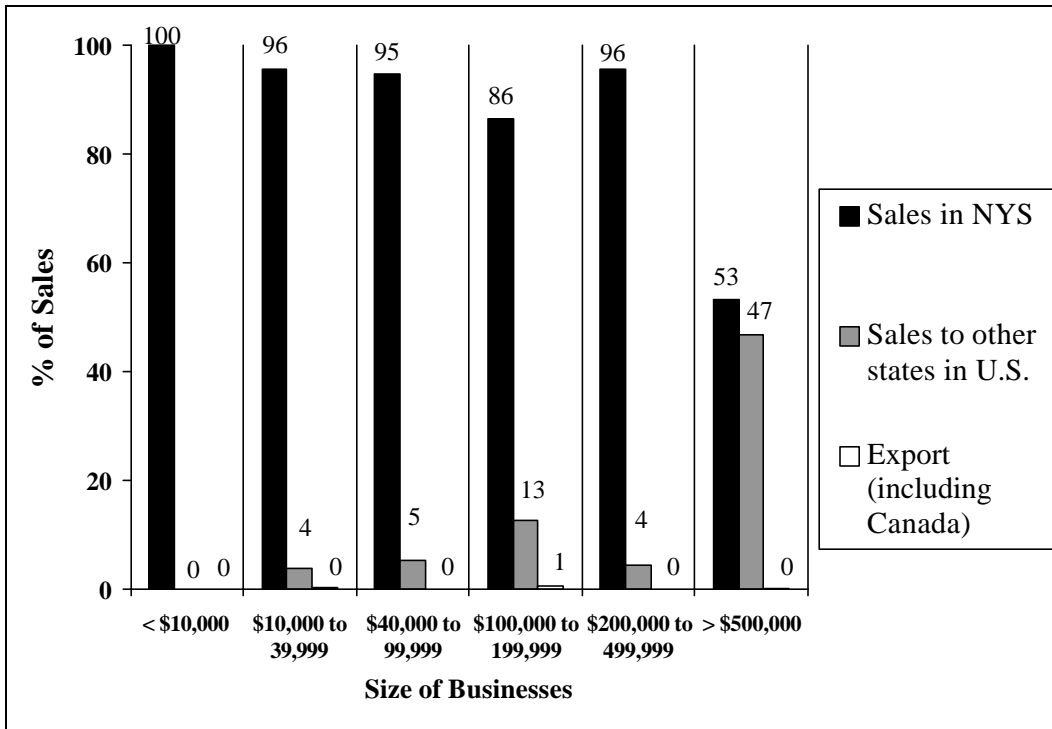


Figure 8. Percent of Sales Value to Each Customer Source, by Business Size



The greenhouse industry also serves as a purchaser of goods and services from other business sectors. The majority of the New York greenhouse businesses (95%) produced some or all of their plant materials, ranging from seeds to finished crops. More than half of the greenhouse operations (55%) purchased some unfinished plant materials from other businesses within the state. An average of 76% of the greenhouse crops sold by New York greenhouse businesses were completely produced in-house, another 13% were purchased prefinished from other operations within New York State, and only 2% of the plant materials were imported from outside of the United States. (Figure 9). Sources for plant materials and values generally did not differ significantly among New York greenhouse operations regardless of size. However, the medium size operations with \$100,000 to \$199,999 sales produced the highest portion of their crops in-house and were least likely to purchase plant materials from other firms (Figure 10).

Figure 9. Businesses Reporting Utilizing the Plant Material Source and Value of Plant Materials, by Source

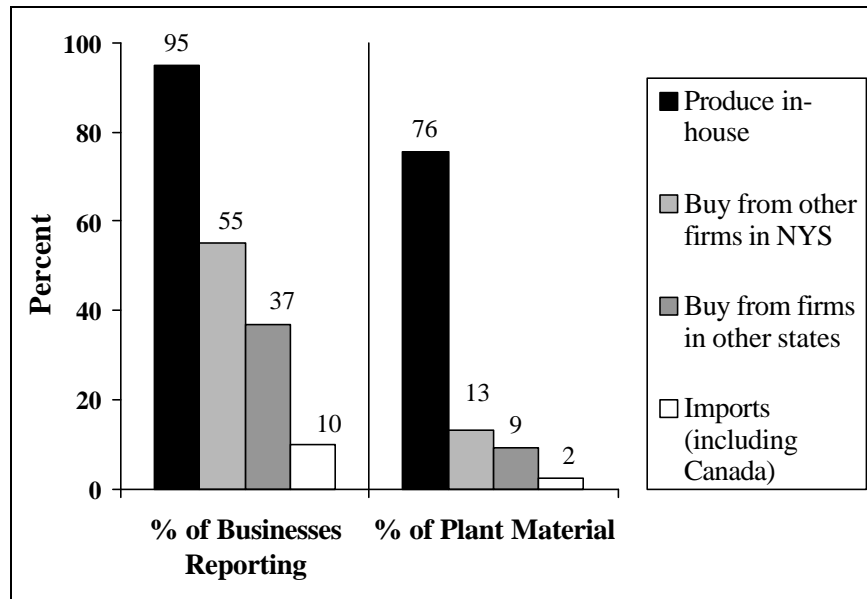
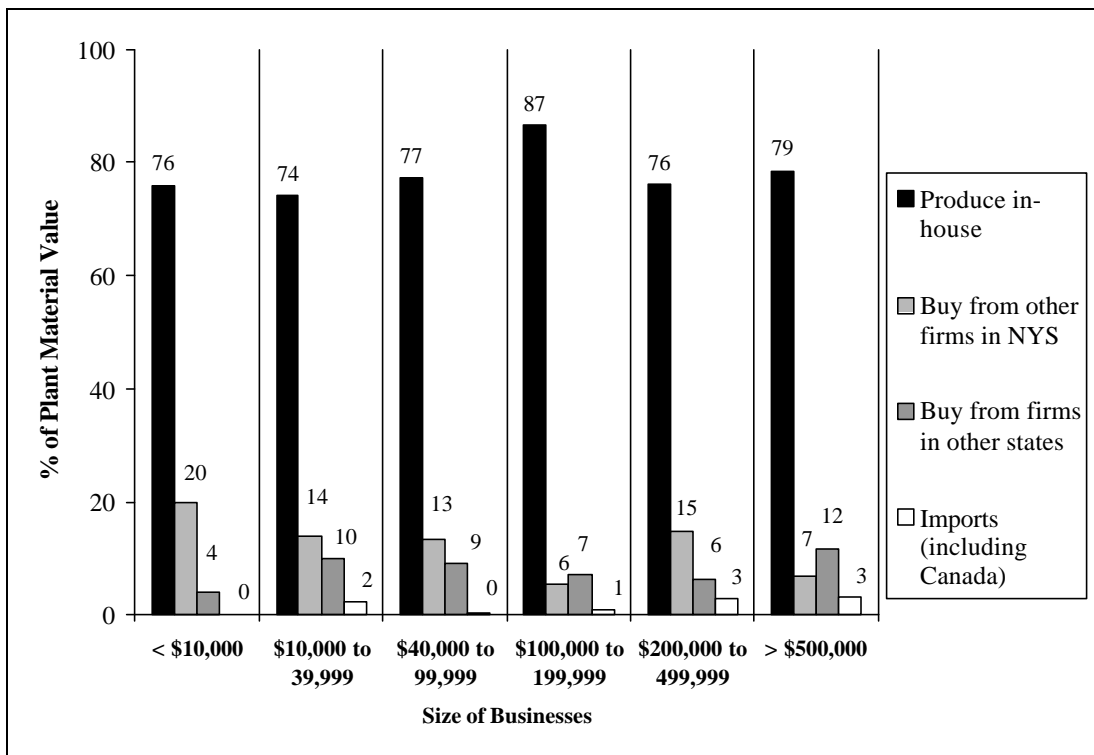


Figure 10. Percent of Plant Material Value from Each Source, by Business Size



Employment

New York's greenhouse industry provides employment opportunities for individuals at many different levels. Employees were classified into five categories: unpaid family members, full-time year-round, part-time year-round, full-time seasonal, and part-time seasonal.⁶ In 1997, an estimated 4,385 full-time equivalent (FTE) jobs were directly attributed to this industry in New York. More than \$67.5 million in wages were paid by the industry. Thus, wages represents about 33% of the total gross sales in the greenhouse industry. The estimated total number of people directly employed by the industry was 7,500. About 40% of these jobs were year-round full-time while the remaining were seasonal, part-time or unpaid family labors (Figure 11). Higher number of workers were employed by larger operations. The business class with \$500,000 or more annual greenhouse product sales comprised about 66% of the total labor force (Figure 12).

Figure 11. Employment in the New York Greenhouse Industry

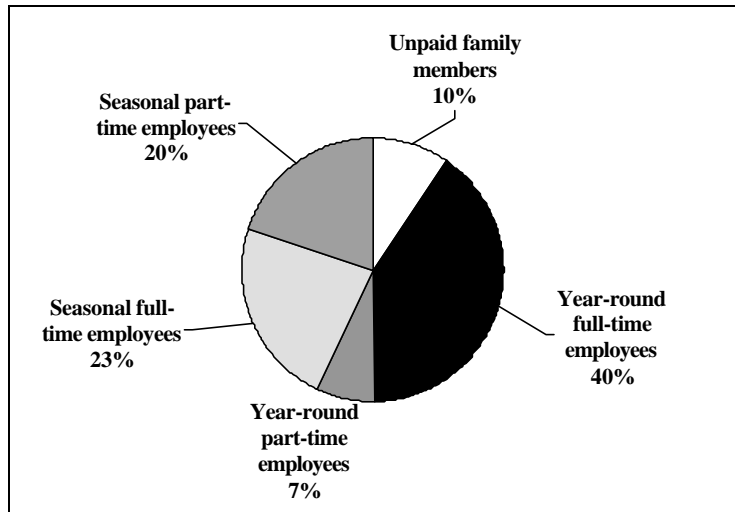
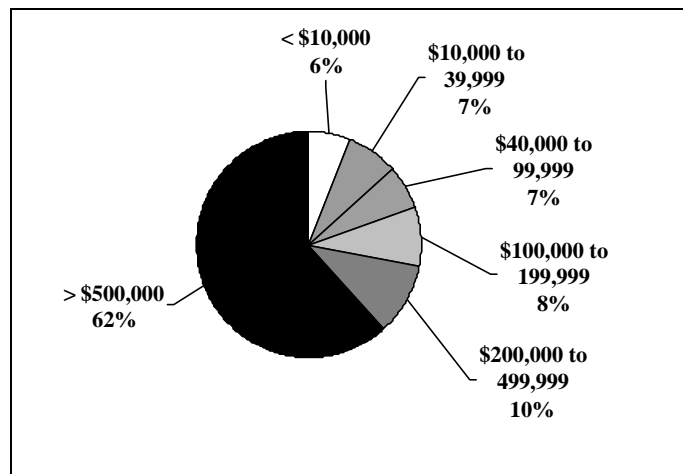


Figure 12. Employment in the New York Greenhouse Industry, by Business Size



⁶ Full-time work: at least 40 hours a week; part-time work: less than 40 hours a week.

Table 9 shows the average number of each type of employee in the six business classes. The industry average showed that larger businesses were more likely to employ higher numbers of individuals. Average employee numbers ranged from 1.8 workers with an estimated 0.53 FTE jobs in small firms (less than \$10,000 in annual greenhouse sales) to 53.5 workers with an estimated 35.48 FTE jobs in larger firms (more than \$500,000 in annual greenhouse sales). Smaller operations had more unpaid family members working for the businesses. Greenhouse operations with \$10,000 to 39,999 annual sales had the highest average number of unpaid family members working for the firm. Many greenhouse businesses in this category were smaller scale, seasonal/part-time operations with limited resource. They tend not to hire outside employees for financial as well as management reasons.

Based on the survey results, larger operations had a higher average number of FTE jobs. However, except for the operations with \$500,000 or more in annual greenhouse sales, the differences of average FTE jobs were not statistically significant among business classes. Also, although the differences are not statistically significant, larger operations were generally more labor efficient, using less labor to manage every 1,000 square feet of greenhouse production area, except for the business classes with \$100,000 to 199,999 annual greenhouse sales.

Table 9. Average Employment in New York Greenhouse Operations, by Business Size

Employment type	Annual Greenhouse Product Sales					
	Less than \$10,000	\$10,000 to \$39,999	\$40,000 to \$99,999	\$100,000 to \$199,999	\$200,000 to \$499,999	\$500,000 or more
Unpaid family member	1.2	1.79	1.17	1.33	0.81	0.15
Full-time year-round	0.0	0.17	0.57	1.33	2.45	26.59
Part-time year-round	0.0	0.08	0.30	0.67	1.13	3.88
Full-time seasonal	0.3	0.22	0.68	2.45	3.18	8.97
Part-time seasonal	0.3	0.48	0.97	3.18	4.87	9.71
Total number of workers	1.8	2.75	3.70	8.97	11.74	53.54
Average FTE	0.53	1.46	2.29	4.52	5.49	34.53*
Average FTE/1,000 ft ² greenhouse area ^a	0.23	0.27	0.21	0.13	0.17	0.16

^a Calculated by average FTE divided by average 1,000 square feet greenhouse production area.

* Significant at P≤0.05, by ANOVA analysis.

Integrated Pest Management Practices

Greenhouse growers were asked about their pest management practices. All of the producers surveyed practiced some degree of integrated pest management (IPM) (Table 10). Three quarters of the producers sanitized greenhouses between crops. More than 60% regularly monitored for pests and kept weekly scout records, and 79% applied pest control measures according to their scouting reports. In general, larger operations reported more vigorous IPM programs.

Table 10. Integrated Pest Management Practices Used by the New York Greenhouse Industry

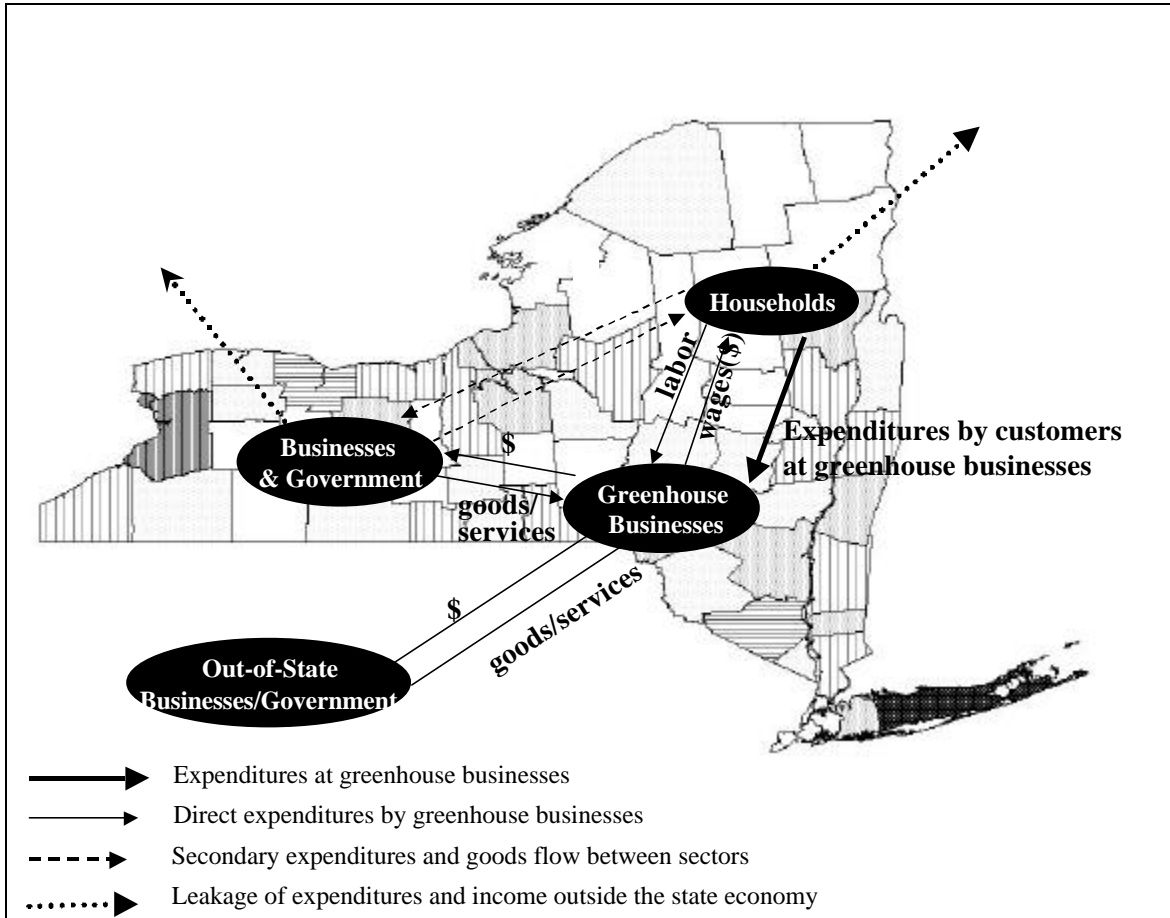
IPM Practices	Annual Greenhouse Product Sales					Total
	\$10,000 to 39,000	\$40,000 to 99,999	\$100,000 to 199,999	\$200,000 to 499,999	\$500,000 or more	
	% growers used this practice					% growers
Monitoring insects with yellow sticky cards	58	54	69	61	85	63
Scout weekly, maintaining scout records	60	64	62	69	71	64
Apply insect control based on scouting reports	80	71	85	78	88	79
Use biological control organisms	20	15	21	28	41	23
Have tried biological control for root diseases	18	18	29	42	61	28
Sanitize the greenhouse between crops	69	74	74	89	85	75

The Economic Multiplier Effects

The sales values and employment generated by the New York greenhouse industry do not convey the total economic impact of these businesses on the state's economy. Additional expenditures, employment, and income are generated as the firms and employees of these firms purchase goods and services from other industries. The economic multiplier summarizes the cumulative (initial/direct, indirect, and induced) effect of initial demand change in the industry, such as changes in output, employment, and income. Figure 11 illustrates the multiplier process for the greenhouse production industry. As the greenhouse businesses accrue revenues, they then distribute these revenues to their employees (represented by the household sector), to their suppliers of goods and services both in- and out-of-state, and to the government sectors in the form of taxes and fees. These "direct" (or initial) expenditures stimulate additional rounds of "indirect" and "induced" expenditures as other businesses and local households make purchases with sales revenue or wage income acquired from the industry. The multiplier process continues with additional

rounds of income and spending, generating smaller effects with each additional round. This is because money leaks out of the state economy through import purchases, taxes, savings, and profits.

Figure 13. Economic Impact of Greenhouse Industry on the New York Economy



The indirect and induced effects of the greenhouse industry on the state economy were estimated by the IMPLAN input-output model for New York. The IMPLAN model does not have a separate greenhouse sector; therefore, the data provided by IMPLAN for the “greenhouse and nursery products” sector was used for the New York greenhouse industry in this study. Table 11 presents results of the input-output analysis for ten agricultural industries in the New York economy.

Table 11. Economic Multipliers ^a by Sector, New York State, 1997

Production Agriculture Industries	Output	Employment
Dairy Farm Products	1.545	1.760
Poultry and Eggs	1.420	1.690
Cattle Feedlots	1.495	1.886
Hogs, Pigs and Swine	1.503	1.333
Fruits	1.662	1.313
Vegetables	1.606	1.544
Forest Products	1.787	1.415
Greenhouse and Nursery Products	1.552	1.334
Commercial Fishing	1.794	1.276
Landscape and Horticultural Services	1.716	1.222

^a Including direct, indirect, and induced effects

The IMPLAN estimates indicate that for every dollar of output generated by the state's greenhouse businesses, \$0.552 of additional output resulted through indirect and induced effects (calculated by 1.552 minus 1.00). And for every job created at a greenhouse firm, 0.334 additional jobs were generated from the secondary effects (calculated by 1.334 minus 1). Thus, the expenditures by greenhouse businesses for goods and services and personal consumption expenditures by firm employees resulted in \$114.2 million in additional output and 1,465 additional FTE jobs in the state (indirect and induced effects). Therefore, the total (direct plus indirect and induced) output and employment effects associated with greenhouse businesses in New York were about \$321 million and 5,850 FTE jobs in 1997.

The estimated output and employment multipliers were calculated using the entire state as a unit of study. Different results might be obtained if a single or a multi-county region was used. One limitation of multiplier analysis is that multipliers are constructed based on a "snapshot" of a regional economy, a pattern of economic transactions between firms and the final users of their products for a single year. Therefore, multipliers can become out of date as structural relationships between sectors change.

SUMMARY AND CONCLUSIONS

The purpose of this study was to estimate the contribution of the state greenhouse production industry to the New York State economy. Since there is no detailed, accurate information on the economic dimensions of the New York State greenhouse production industry, this study provides economic data that is valuable to the industry in serving as a starting point for defining its scope and dimensions.

The total sales generated by New York greenhouse production was estimated at \$206.8 million in 1997. The New York greenhouse production industry includes retail and wholesale businesses. The average sales value of New York businesses from greenhouse crops was \$413,844, and the average greenhouse area was 37, 834 square feet in 1997. Results of this study showed that sizes of greenhouse businesses in New York State varied significantly. While only about 9% of the businesses had more than \$500,000 annual greenhouse sales in 1997, they generated more than 70% of the total industry sales. The top 20% of the businesses reported more than 80% of the greenhouse production sales in the state.

Sales revenue generated by the overall industry were primarily from the production and sale of floriculture crops (90.4%) with the remaining 9.6% of the sales from prefinished plants, propagative materials, greenhouse vegetables, and other crops. Among greenhouse crops produced in the state, bedding/garden plants were no doubt the most important production line for New York producers and accounted for the highest sales. New York producers generated an average total of \$10.9 per square foot greenhouse space from crop production in 1997. Although retail marketing was used by the majority of greenhouse businesses (79%), wholesale to mass marketers generated 45% of the total industry sales and was utilized by only 10% of the industry members.

It was estimated that the New York greenhouse industry directly employed about 7,500 individuals and contributed an estimated 4,385 FTE jobs and a total payroll of over \$67.5 million in 1997. Many of these individuals were hired on a seasonal basis. The total economic effects (direct plus indirect and induced) were estimated to be \$321 million in output and 5,850 FTE jobs in 1997.

This study focused on the values of greenhouse production and does not measure the total contribution of the floriculture industry to New York State. It does not estimate sales by out-of-state suppliers of greenhouse products to customers in the state. Also, it included greenhouse vegetable, nursery crop and other greenhouse crop production and did not include floriculture crops produced on open ground. This study represents a starting point. The database needs to be maintained to identify industry trends. To compete with other leading producers of greenhouse crops, New York must better understand trends in the industry, and the forces driving production and marketing changes in New York and other competing states.

REFERENCES

1. New York Agricultural Statistics Service, 1998 & 1999, New York Agricultural Statistics, New York State Department of Agriculture and Markets, Division of Statistics, Albany, New York.
2. USDA, National Agricultural Statistics Service, 1997 Census of Agriculture.
3. Jack, Kevin, Nelson Bills, and Richard Boisvert. 1996. Economic Multipliers and the New York State Economy. Policy Issues in Rural Land Use Newsletter V.9(2): December 1996.

APPENDIX

New York State Greenhouse Industry Survey

September 1998

Dear New York Greenhouse Operator:

The Greenhouse and Controlled Environment Agriculture Program at Cornell University in cooperation with the Department of Agriculture and Markets, New York State Flower Industries and Long Island Flower Growers in affiliation with other state greenhouse growers' organizations is conducting a survey of all growers to collect much needed information on greenhouse production, sales and employment by the New York Greenhouse Industry during 1997. This study will provide much needed information on the economic profile of the greenhouse industry in New York State, which will greatly assist us on pursuing support within the university or from legislative institutions at state or local level. The information you provide will be kept confidential, and only aggregate industry data will be used in the final report. A response from every greenhouse operation is important to insure accurate survey results. Your prompt response is greatly appreciated.

Sincerely,

John Sanderson
Chairman,
Greenhouse and Controlled Environment Agriculture
Program
Cornell University

Steve Rockcastle
President
New York State Flower Industries

Dear Fellow Growers,

I am chairman of the Advisory Board for the Greenhouse and Controlled Environment Agriculture Program at Cornell University. Our board realized early on that if we are going to be successful in lobbying for our industry at Cornell and the state and local government level we need to be able to tell our story with respect to the greenhouse industry's economic impact on the state's economy. It is therefore imperative that we have your full cooperation on this survey. It will only take a few moments and your cooperation will directly impact our ability to get the industry message across. Please fill it out and return it **NOW**.

Thanks for your cooperation.

Sincerely,

Henry Talmage
Talmage Farm, Riverhead New York

Special Instructions

1. Please report for all your operations in New York State.
2. Include all production grown under glass, fiberglass, plastics, cloth, and other covers.
3. Please provide your best estimates if your book figures are not available.
4. Value of sales should be the value received before deductions for commissions and transportation.
5. Report totals for calendar year 1997 or your last complete fiscal year. If for a fiscal year, please indicate
_____/_____/_____ to ____/____/_____.
Month Year Month Year
6. **Please return your response in the enclosed envelope with your application.**

1. Did you produce and sell any greenhouse crops during 1997?
 Please check one: Yes _____... Continue to item 2 below.
 No _____... Go to **Section D** on Page 4.
2. During 1997, did your total retail and wholesale sales of greenhouse crops exceed \$10,000?
 Please check one: Yes _____
 No _____

SECTION A: VALUE OF SALES AND AREA OF PRODUCTION
(From greenhouse operations only)

1. Your total gross receipts from greenhouse crops during **1997**:..... \$ _____
2. What amount of the total receipts in **item 1** above was from:

	<u>Dollars</u>
a. Wholesale to florists	\$ _____
b. Wholesale to garden centers	\$ _____
c. Wholesale to mass marketers	\$ _____
d. Wholesale to other growers	\$ _____
e. Retail Sales	\$ _____
f. Other (Please Specify):	
_____ ...	\$ _____
_____ ...	\$ _____

Note: The sum of dollars should equal the total dollars in item 1 (above)

3. What amount of the total receipts in **item 1** was from the following crop categories and their growing area:

	<u>Dollars</u>	<u>Square Footage of Production Area</u>
a. Bedding/Garden Plants (Include perennials in this category)	\$ _____	_____ ft ²
b. Finished Potted Flowering Plants (Include potted bulbs in this category)	\$ _____	_____ ft ²
c. Finished Potted Foliage Plants	\$ _____	_____ ft ²
d. Cut Flowers & Cultivated Greens	\$ _____	_____ ft ²
e. Prefinished Plants	\$ _____	_____ ft ²
f. Unfinished Plants & Propagative Materials (i.e. Plugs and rooted cuttings)	\$ _____	_____ ft ²
g. Greenhouse Fruits & Vegetables (Please Specify):		
_____	\$ _____	_____ ft ²
_____	\$ _____	_____ ft ²
h. Other (Please Specify):	\$ _____	_____ ft ²

4. The total square footage of your **protected/covered** growing area: _____ square feet.

5. What portion of the total greenhouse production area from **item 4** was:

	Square feet
a. Glass Greenhouses	_____ ft ²
b. Fiberglass and Other Rigid Greenhouses	_____ ft ²
c. Film Plastic (Single/Multi) Greenhouses	_____ ft ²
d. Shade and Temporary Cover	_____ ft ²

Note: The sum of a + b + c + d should equal the total square footage in item 4 (above).

6. What percent of the greenhouse products sold by your firm during 1997 was:

- a. Grown entirely by your operation? %
- b. Purchased unfinished products from another New York greenhouse operation?.. %
- c. Purchased unfinished products from greenhouse operations in other states? ... %
- d. Imported unfinished products from other countries? %

7. What percent of the greenhouse products sold by your firm during 1997 was:

- a. Sold to buyers within the New York State? %
- b. Sold to buyers within the United States but located outside New York State? %
- c. Exported to foreign markets (including Canada)? %

SECTION B: EMPLOYMENT (Greenhouse Operations Only)

1. How many **unpaid** family members worked for your operation during 1997? _____

- For a total of how many months? _____ months.

(Example: one person worked for 12 months and another worked for 6 months equal to a total of 18 months.)

3. What was the total number of **paid** employees on your payroll during 1997? _____

4. Of the total number of **paid** employees (item 2 above), how many were

a) Year-round full-time employees: _____

b) Year-round part-time employees: _____

c) Seasonal full-time employees: _____;

For a total of how many months a year? _____ months.

(Please use the example in item 1)

d) Seasonal part-time employees: _____;

For a total of how many months a year? _____ months. **(Please use the example in item 1)**

4. What were the total 1997 wages paid by your greenhouse operation? \$ _____

SECTION C: IPM PRACTICES

1. Are you monitoring insects with yellow sticky cards?
Please check one: Yes _____, No _____
2. Do you scout weekly, maintaining records on the appearance of pests and disease?
Please check one: Yes _____, No _____
3. Do you apply insect control measures based on scouting reports?
Please check one: Yes _____, No _____
4. Are you using any biological control organisms (parasites, predators or insect pathogens) for insects?
Please check one: Yes _____, No _____
5. Have you tried biological control for root diseases?
Please check one: Yes _____, No _____
6. Do you sanitize the greenhouse between crops?
Please check one: Yes _____, No _____

SECTION D: OTHER CROPS AND TOTAL LAND OPERATED

1. Do you have more than one location of business in New York State?
Please check one: Yes _____, No _____
2. During 1997, did you produce and sell any crops on open ground?
Please check one: Yes _____ .. Go to Item 3
No _____ .. Thank you.
3. What was the acreage of the total open ground production area? _____ acres.
4. What portion of the open ground production area was used to produce the following crop categories?

	<u>Acres</u>
a. Floriculture Crops (i.e. field -grown bedding/garden plants, cut flowers & greens, flowering & foliage plants, perennials, and bulbs)	_____ acres
b. Nursery Crops (i.e. outdoor landscape trees, shrubs and ground covers) .	_____ acres
c. Flower & Vegetable Seed Production	_____ acres
d. Turfgrass Sod	_____ acres
e Other (Please Specify): _____	_____ acres

NOTE: The sum of acres should equal the total acres in item 2 (above).

Name of establishment: _____
 Address: _____
 Phone: _____
 Reported by _____ (Name) _____ (Title) _____ (Date)

Thank you very much for your cooperation.

Please return this survey to: Department of Floriculture and Ornamental Horticulture, 20 Plant Science Building,
 Cornell University, Ithaca, NY 14853.