MONROE COUNTY
GREENHOUSE INDUSTRY
MARKET REASEARCH STUDY

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Prepared for

Monroe County Department of Planning and Development

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October, 2001

ACKNOWLEDGEMENTS

The completion of this project would not be possible without the assistance of many individuals. I would like to thank the Monroe County Economic Development, Tom Battley, Manager, for providing partial financial support for this project. I would like to extend special thanks to Rochelle Bell, Peter Callen, and Mack Mariani at the Monroe County Department of Planning and Development; and Margaret O'Neill, Bob King, and Brian Eshenaur of Cornell Cooperative Extension of Monroe County for insight, arrangements and encouragement. Thanks also to greenhouse operators who returned their questionnaires, and to those who allowed me to visit their businesses and gave me insight into the industry in Monroe County. Thanks to Wen-Fei Uva, Ralph Freeman, Bridget Behe, and several Canadian growers for their insights into the greenhouse business in the U.S. I would also like to extend special thanks to Edouard Mafoua for his assistance in coding, entering, and analyzing the data, especially the empirical analysis.

This project is funded in part by the Rural New York Community Planning and Preservation Grant Program administered jointly by the New York Planning Federation and the Preservation League of New York State. Support is provided by the J.M Kaplan Fund and The Andy Warhol Foundation for the Visual Arts.

In-kind services are provided my Lockwood Mapping Company, a division of Sanborn Map Company, and from the following State University of New York Programs: Department of Geography and Planning at Albany: Department of Landscape Architecture, School of Environmental Science and Forestry at Syracuse; and the Department of Geography at New Paltz.

The Rural New York Grant Program supports local grassroots efforts throughout New York State focusing on the preservation of the built and natural environments and land use planning. Since 1993, the Rural New York Grant Program was awarded over $2.0 million in direct support to 644 projects.

Forty-six grants in thirty-one counties totalling $145,535 were made by the Rural New York Community Planning and Preservation Grant Program in 1999. Their grant to the Monroe County Department of Planning and Development in 1999 made the completion of this project possible.

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EXECUTIVE SUMMARY

The green industry is usually divided into the floriculture (greenhouse) sector and the environmental horticulture (nursery) sector. The floriculture sector includes cut flowers, cut cultivated greens, potted flowering plants, potted foliage plants, and bedding and garden plants. The environmental horticulture sector includes crops usually grown outdoors and used primarily for landscaping purposes, such as trees, shrubs, ground covers, turfgrass or sod, bulbs, and planting stock (Johnson, 1997).

According to the U.S. Department of Agriculture (USDA) Economic Research Service (1999), the green industry is the fastest growing sector of U.S. agriculture, representing 11 percent of gross cash farm crop receipts in 1997. New York is a key player in the green industry. New York ranks 10th in floriculture and environmental horticulture cash receipts, down from 5th in 1987.

Despite its lower rank, the green industry in New York benefits from a population with a high average income and a highly educated population. However, New York also has certain weaknesses. These include climate, cost of production, and labor shortages. The growth of the mass market has reduced costs and resulted in consolidation, but the shift from a production-driven to market-driven economy has also resulted in numerous niche markets which can be exploited by local producers.

This project was conducted to explore the drivers of the greenhouse industry in Monroe County: its strengths, weaknesses, opportunities, and threats. The literature on floriculture in New York and elsewhere was reviewed; a survey of greenhouse firms was conducted and analyzed; and professionals in the green industry on Long Island and in Michigan and Canada were interviewed. This paper will identify trends, market potential, growth potential and present recommendations for future directions.

Sixty-seven questionnaires were mailed in the winter of 2000. Thirty-six questionnaires were returned, 21 of which were completely filled out, and indicated that they are a commercial greenhouse business. The total annual gross sales volume for greenhouse floricultural crops in Monroe County in 1999, for the 21 respondents to the greenhouse survey, was $6.8 million. The average sales per greenhouse firm are $326,095. The industry employs 114 people at the peak production time in May. The average greenhouse in Monroe County is 21,563 square feet in size, selling about ¾ of their product retail, and ¼ through wholesale channels. Bedding plants are the most important crop, but there is a lot of diversity within the county. Even though the average greenhouse is only about ½ acre in size, they are full-time businesses, generating a substantial amount of income. All respondents with greenhouses that are at least ¼ acre in size are full-time businesses for the owner, and are the owner's major source of income.

Further analysis of the survey data suggest that retail growers in Monroe County consider large retail chains that are mass merchandisers to be their major competition, while wholesale growers consider Canadian growers to be their major competition. Despite competition from Canada and preferential advantages afforded Canadian growers since NAFTA took effect in January 1994, the industry is growing and thriving. New firms have been created, and older ones are still in business. Survey results indicate that the years the firms were created range from 1880 to 1997. Six respondents increased the size of their greenhouse operation in the last five years, an average of 16,844 square feet each. Only one firm decreased in size in the last five years, and this decrease was 4,000 square feet. Nine firms plan to expand their operation in the next five years.

When respondents identified the greatest deterrents to expanding their greenhouse operations respondents indicated that business management and marketing issues were much more important than production issues. These deterrents would negatively impact the greenhouse industry by resulting in excess supply. Thus, respondents ranked market demand, their own managerial expertise, production costs, and competition to have the major impacts on their businesses in rank order of importance from a list of choices that they were given. About an equal number of respondents ranked their own managerial expertise and their ability to attract and retain hourly employees as important as those whose ranked it very minor. This indicates wide variation in areas of expertise, and that greenhouse managers would learn a lot from each other through management clubs, discussion groups, grower associations, etc.

When asked to rank a list of factors which impact production (the traditional area extension programs emphasize), the uncontrollable factors such as weather and water quality were most important. Crops scheduling, and cultural requirements were not considered very important.

In pricing their crops, producers considered market demand as the most important factor, followed by cost of production and product uniqueness.

Results of an empirical analysis conducted on the survey results show that increasing diversification has a negative impact on the sales per square foot of greenhouse space. This suggests that while some degree of diversification reduces market risk, too much diversification has a negative impact on profitability. Producers should consider an attempt to specialize and perhaps buy in product from lower cost producers to supplement what they produce.

A review of other greenhouse industry in the northeastern United States indicates that Long Island is a center of greenhouse production. Their success is due to a combination of factors including weather, wealthy population, and a strong extension program. Michigan is another successful greenhouse producing area that has a large population center, a strong extension program, and a history of grower organizations that fund research and educational meetings. Canada is a growing center of greenhouse production that is giving U.S. growers considerable competition. Canadian success include NAFTA; favorable exchange rate; Dutch immigrants in the industry who brought in the concepts of specialization, automation, cost control, pre-selling on a contract basis, and cooperative buying of energy. The Monroe County producers who are successful despite competition from Canada seem to be the ones who don't compete head on, but instead find niches that the Canadians don't serve. Some of them also buy the cheap, generic plants from the Canadians, and then grow other high value crops.

Monroe County producers have the advantage of a high-income population center, as do Long Island and Michigan. They have Cornell Cooperative Extension of Monroe County (Extension) and the Monroe County Division of Planning interested in their concerns. This seems a key time to strengthen cooperation between these agencies and producers, and to develop a strong grower organization to offer training and perhaps cooperative marketing and purchasing services for producers.

Trends in the Monroe County Greenhouse Industry

- The industry is growing at a rate of about 5% per year after a rapid growth of 10% annually in the 1980s. The rate has slowed down, indicating that the industry is now a mature market. Producers will have to be more competitive than in the past to survive.

- Bedding plants are still the major crop in the region accounting for about one-third of sales, but there are several specialty growers. Each producer is unique and appears to have found a specific niche that keeps them competitive.

- The greenhouses in Monroe County are fairly small (21,563 square feet in size) and the focus is on retail (3/4 of sales are retail).

- The focus on retail, and thus high sales per square foot of production mean that greenhouses that are at least ¼ of an acre in size are full-time businesses for the owner, and are the owner's major source of income.

- Business that have identified a niche market and are somewhat specialized have higher sales per square foot that less specialized producers.

- The business is very seasonal with the month of May, the prime bedding plant season, accounting for 40% of sales.

- The ratification of NAFTA in January 1994 has given Canadian growers just across the border easy access to U. S. markets, and has made competing profitably more difficult for wholesale growers in Monroe County.

- The growth of mass merchandisers and consolidation is resulting in market saturation and is putting downward price pressure on all producers. Thus there is a need to focus on quality, service, and locally produced products and other marketing tools, as well as looking for ways to decrease cost of production.

- The recent increase in fuel prices, the potential of another increase in minimum wages, and a slowing economy all put pressure on producers to look for ways to reduce costs and control debt so that they can survive a possible economic downturn.

- The USDA has targeted the Northeast as an under served area for crop insurance. The new Adjusted Gross Revenue crop insurance program was particularly developed for specialty crops such as greenhouse crops. This program could address concern that some producers expressed in visits to Monroe County for a need for affordable crop insurance.

Recommendations for Monroe County Producers

- Look for energy conservation measures such as energy curtains and look at locking in fuel purchases or having convertible boilers so they can switch fuels if the relative price changes.

- Consider automation and other ways to reduce labor and other costs. Labor costs are relatively low in Monroe County compared to other locations, but many producers are worried that minimum wages may go up.

- Attend courses on labor management to maximize production by the labor force.

- Do not compete directly with Canada, but instead differentiate product: grow products of different sizes; choose products not grown in Canada; grow value added products; and look for markets Canada cannot service as well. Buy in plants from Canada that they grow cheaper than the cost of production in Monroe County.

- Look for retail opportunities such as value added. Adding services and different types of plants is generally welcome by high-income consumers. Pre-planting dish gardens, planters, and moss-lined hanging baskets are some examples of this that several producers in Monroe County are already doing.

- Look for niche markets. Most producers in the County are already doing this and have found crops that are unique to their operation, or that they produce better than the competition. Learn to listen to customers to pick up on these markets. Also look to sources such as Martha Stewart to spot trends.

- Buy some crops from Canada and resell them, while specializing in higher value crops.

- Increase market demand by promoting locally grown, point-of-purchase promotions, etc.

- Consider forming grower discussion groups to share managerial as well as production advice. The bimodal responses from growers on factors that impact how they grow healthy plants suggest that growers can benefit from talking to each other.

- Increase business management expertise by taking part in training programs.

- Reduce debt if possible, or secure an operating line of credit to get through the season. Debt is necessary for capital improvements and operating costs, but producers with too much debt cannot weather a financial storm as well as those with lower debt. Work with lenders and accountants to analyze your situation.

- Look into purchasing Adjusted Gross Revenue Crop insurance as a way of reducing uncontrollable risks.

Recommendations for Cornell Cooperative Extension and Monroe County Department of Planning and Development

- Designate or hire someone to work specifically with the green industry.

- Continue cooperative arrangements between Extension and the Department of Planning and Development and other agricultural agencies and surrounding counties to develop educational programs.

- Develop a green industry advisory committee consisting of extension and county staff as well as growers to create a grower organization for the county and to deliver programs that address grower's needs.

- Focus education efforts on marketing, business management, and labor management. Cornell has excellent programs in labor management and greenhouse management. Utilize these resources as well as bringing in outside expertise as needed.

- Convey energy conservation methods and repeat Extension programs on energy conservation. This is a particularly pressing issue now and should be a good program to revitalize the industry participation in extension programs.

- Develop programs on debt reduction, cash flow management, and capital management. These types of programs will help growers compete with Canadian producers and the mass market as well as survive an economic downturn.

- Provide subsidies or tax breaks for energy conservation or for paying the heat bills in greenhouses along the lines of the energy conserving appliance rebate being given to consumers by the state. If the county cannot offer these programs, work to have the state develop a rebate program for farmers.

- Focus educaton programs on cash flow management so that producers can weather energy price increases.

- Focus on a marketing emphasis to find niches where they can charge higher prices to cover the costs. Grower panels showcasing how some growers are doing this successfully would help build a grower organization, and help growers help others.

- Use New York FarmNet programs to help transition new producers into the business as older ones retire.

- Provide estate planning to help businesses continue.

- Work to promote locally grown programs and encourage state efforts in this direction.

- Provide programs in helping greenhouse owners determine their costs of production. Since most growers produce a multitude of crops, the often don't know which ones are profitable. The empirical analysis suggests the productivity would increase by reducing the number of crops produced. Analyzing costs would help them determine which ones to drop and instead purchase from other growers.

- Continue to offer courses in production and new crops so that producers can compete on quality.

- Work closely with Extension staff and the Greenhouse Horticulture Program work team to make sure problems in Monroe County are addressed and that the results of the efforts are disseminated to producers in Monroe County via publications and extension programs.

1.0 INTRODUCTION

Often overlooked in the agricultural sector are agricultural products that enhance the quality of life either through their aesthetic properties or environmental enhancing properties. The U.S. leads the world in the production and marketing of flowers, cut foliage, potted plants, bedding plants, turfgrass, and other nursery crops. These combined products have grown to be known as the "green" industry, also called floriculture and environmental horticulture.

The green industry is usually divided into the floriculture (greenhouse) sector and the environmental horticulture (nursery) sector. The floriculture sector includes cut flowers, cut cultivated greens, potted flowering plants, potted foliage plants, and bedding and garden plants. The environmental horticulture sector includes crops usually grown outdoors and used primarily for landscaping purposes, such as trees, shrubs, ground covers, turfgrass or sod, bulbs, and planting stock (Johnson, 1997).

According to the U.S. Department of Agriculture (USDA) Economic Research Service (1999), the green industry is the fastest growing sector of U.S. agriculture, representing 11 percent of gross cash farm crop receipts in 1997. New York ranks 10th in floriculture and environmental horticulture cash receipts, down from 5th in 1987. While sales in New York are growing, sales in the South and West are growing faster.

Land in farms in New York decreased 3 percent and the number of farms decreased by 8 percent from 1992 to 1997 (New York State Dept. of Agriculture and Markets, 1999). Because New York has high labor costs and a cooler climate than states in the South, the state needs to focus on high value agriculture like the green industry to preserve farmland. Strengths for the New York green industry include high personal income and a highly educated population. Weaknesses include climate, cost of construction, and labor shortages. The growth of the mass market has reduced costs and resulted in consolidation, but the shift from a production-driven to market-driven economy has also resulted in numerous niche markets which can be exploited by local producers.

This project was conducted to explore the drivers of the greenhouse industry in Monroe County: its strengths, weaknesses, opportunities, and threats. The literature on floriculture in New York and elsewhere was reviewed; a survey of greenhouse firms was conducted and analyzed; and professionals in the green industry on Long Island and in Michigan and Canada were interviewed. This paper will identify trends, market potential, and growth potential, and present recommendations for future directions.

2.0 LITERATURE REVIEW

2.1 The U.S. Green Industry

According to the USDA Economic Research Service (1999), the green industry is the fastest growing sector of U.S. agriculture; it represented 11 percent of gross cash farm crop receipts, or $3.5 billion, in 1997. The U.S. green industry experienced strong growth during the 1990's of about 5 percent annually. The value of production has grown an average of $440 million a year since 1991. This growth follows a decade of 10 percent growth in the 1980's (Johnson and Christensen, 1995; Johnson, 1988, 1991, and 1992; Johnson and Johnson, 1993). Grower cash receipts for U.S. floriculture and environmental horticulture reached $12.1 billion in 1998, up 2 percent from 1997. According to USDA, grower cash receipts should reach $15 billion in 2005.

The U.S. green industry is the second most important sector in U.S. agriculture in terms of economic output, according to a University of Georgia study that took into account the value of inputs purchased and returns from product handling, marketing, and distribution. This study also revealed that, among the various agricultural sectors, the green sector is a major employer. Only the combined crop sector including vegetables, fruits, tree nuts, and hay and pasture employed more person-years in 1990 (Johnson and Christensen, 1995).

Several studies have analyzed the economic contribution of the green industry using Impact Analysis for Planning (IMPLAN) an input-output model developed by the U.S. Forest Service. These studies examined the relative size of the green industry within the U.S. economy and how it is linked to supporting industries through the volume of transactions and economic impact multipliers. Turner and Kriesel (1995) examined the impact of the green industry on the U.S. economy in 1990 using IMPLAN. They concluded that in 1990, the green industry was the second leading employer in the U.S. in production agriculture. In terms of output, the greenhouse and products sector ranked sixth within production agriculture, behind cattle, other livestock grains, other crops and oil-bearing crops.

In 1997, U.S. consumers spent $16 billion on floriculture ($59 per capita), which was the 12th highest in the world in terms of per capita expenditures on indoor flowers/plants. The leading countries with respect to per capita consumption of floriculture products are Japan, Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Norway, Sweden, and Switzerland (Johnson, 1997). Americans, on the other hand, are by far the leading consumers of outdoor landscaping plants. In 1997, U.S. consumers spent $37 billion on environmental horticultural products, or $138 per capita. A robust economy usually generates increases in housing and other construction. This eventually leads to increased sales of environmental horticultural products, although there is usually a lag between sales of landscape plants and new construction. This lag can be anywhere from 6 months (Johnson, 1997) to two years (Gineo and Omano, 1990).

Many problems in the green industry relate to economic and environmental constraints. Economic constraints include changing resources, costs (such as equipment, labor, and chemicals), and demand for plants. Environmental constraints revolve around water and soil quality, weather and pest-related stresses, and aesthetic and biological requirements.

Another important problem to be considered is the comparative advantages of producers in some regions of the United States. All 50 states produce greenhouse and nursery crops, but the top 10 states (California, Florida, North Carolina, Texas, Ohio, Oregon, Michigan, Pennsylvania, Oklahoma, and New York) produce two-thirds of the total U.S. sales value of greenhouse and nursery crops. Aggregate data suggests that although the leading ten states' percentage of total

grower cash receipts for greenhouse and nursery crops has remained stable (at between 65 and 70 percent) over the last 30 years, the composition of these ten states has changed. From 1996 to 1987, New York dropped from fifth to tenth (Johnson, 1990).

Issues addressed by research for the green industry include optimal product mix, cash flows, pricing strategies, and computer applications. These studies found that resource availabilities, input costs, and wholesale prices prevalent in climatic zones 8 and 9,as well as labor, capital, and cash flow constraints do indeed influence production decisions made by nurserymen. Nurserymen must produce a certain minimum quantity of each plant species to make the nursery attractive to buyers (Kizer, et al., 1987; Phillips, 1988; Hall and Phillips, 1989; Phillips and Hall, 1990; Rhodus and Taylor, 1990; Hall and Phillips, 1990a; Turner, 1990; Phillips, 1991; Hall and Phillips, 1990b; and Barton, et al., 1994).

Some studies have focused on the efficiency and profitability of the greenhouse industry by market period, market channel, size of firm, and crop (Kirschling and Jensen, 1974; Brumfield et al., 1982, 1984, Sowell et al., 1982; Johnson and Johnson, 1993). Small and medium-sized farms are striving to maintain the efficiency and profitability of their operations and the financial viability of their families and communities. This is due to dramatic changes in the global agricultural environment. In terms of policy implications, it is important to determine what factors lead to the improvement of the efficiency of small and medium-sized firms or to which variables it is related (e.g. age, education, extension services, access to credit, technical skills, farm size, fixed inputs, risk, leverage, etc.). Greenhouse firms are diversified multi-crop firms. They need to know which crops are most cost-effective for their operations. It is difficult for an operator to determine how changing crop mixes may impact the firm's scope efficiency (cost saving from diversification).

Adelaja et al. (1996) investigated the demand and supply side factors that drive the growth and contraction of the ornamental industry in New Jersey using a revenue share model. Results obtained confirm the importance of consumer purchasing power, population growth, and real estate activity in encouraging increased ornamental activity.

Productivity refers to the efficiency of the operation of the greenhouse business. When each production unit is utilized at peak efficiency revenues are increased, expenses contained, and profitability maximized. A critical determinant of many growers' profitability is the effective utilization of their greenhouse space. Achieving high sales per square foot of space is dependent upon maintaining the proper level and mix of crops, thereby realizing high turnover rates and healthy margins. Higher sales per square foot in a greenhouse usually accompany higher profits (Strain and Hodges, 1987).

A series of studies was concerned with input-output relationships and costs of producing specific plant species including Kurume azaleas, crape myrtles, dogwood, forsythia, Buford holly, Pfitzer juniper, and pin oaks (Badenhop, et al., 1979; Badenhop, 1980; Smith, 1980; Smith and McConnell, 1981; Badenhop, 1979). In these studies, the advantages of various production regions in competing for markets were delineated. Data relating to prices, product mix, distribution patterns, and other characteristics of marketing were analyzed, along with sales invoices from representative samples of nurserymen (Free and Vitelli, 1979; Gamble, 1979; Massey, 1979; Phillips, 1979; Einert, 1979; Smith and McConnell, 1979; Smith, 1979; McNiel, 1979; Wright, 1979; Crafton, et al., 1982). Differences in cultural practices accounted for most of the variation in the cost per salable plant. Wide variation also occurred in the kind, amount, and value of chemicals used in the production process. Variations in production techniques were more common than homogeneity of production. Economies of scale were evident.Variations in cost

estimates may occur due to size of the container, kind of the plant, size and type of truck, type of load, backhaul, loading and uploading rates, and shipping charge per mile.

The structure, conduct and performance (industrial organization) of the industry were the attention of studies of the competitive market situation and environment (Taylor, et al., 1989; Turner and Stegelin, 1989; Ames, 1990; Behe, et al., 1990; Hodges and Haydu, 1990; Phillips, et al., 1990; Bauer and Brooker, 1991; Brooker, 1991). The ornamental industry has expanded at a greater rate than almost any agricultural sector. Grower cash receipts grew from 5.0% of all crops receipts in 1981 to 9.1% in 1986. The trend continued in 1994 as receipts were estimated to be about $7.0 billion or 11% of all cash crop receipts. The economic research in the area of ornamental horticulture involves four problem areas: (1) no homogeneous crops; (2) lack of data on production, flows, and prices; (3) a general lack of uniformity (grades) with respect to specific crops; and (4) difficulty in completing demand, price, and spatial equilibrium analysis.

Change of product ownership in competitive agricultural industries is a critical event, yet little research has examined the transaction methods used by firms and the corresponding factors that influence the choice of transaction method. A sample of landscape plant nurseries across the U.S. provided data to model this decision. Transaction methods included sales by telephone, personal visits, mail order, and at trade shows. In addition, factors that influenced negotiated sales were investigated. Influential factors included age of the business, size (as measured by gross sales), location, market channel used, ownership structure, and perspective on competitive situation. Using a tobit estimation procedure, profiles of nursery firms more likely to use a particular transaction method were developed (Hinson, et al., 1995).

Recent Greenhouse Research

A survey of the commercial members of the Perennial Plant Association (PPA) indicated that gross sales of perennials by PPA members for 1994 was an estimated $1.38 billion, with 29 percent of this amount generated from sales of perennial plants. Sales of perennials increased over 1993 levels for 86 percent of all respondents. The most popular genus sold in the U.S. for 1994 was Hosta, followed by: Hemerocallis, Coreopsis, Chrysanthemum, and Astilbe (Rhodus and Hoskins, 1995).

Research revealed that consumers preferred red poinsettia cultivars when compared to other colors (Behe, et al., 1997b). Consumer research was conducted in garden centers to investigate preferences for geraniums by asking the flower color, leaf variegation, and price combinations (viewed in photographs on display board) they would or would not purchase. Red and lavender were the preferred colors, while zonal and plain were the most preferred leaf variegation, and low prices were preferred. A simulated blue geranium was not popular as it consistently ranked in the lower third of the preferred combinations (Behe, et al, 1997a). Another product demand that was investigated using focus groups was wildflower sod (Barton, et al., 1996).

Research was conducted on consumer perceptions and expectations of garden center products service quality (Hudson, et al., 1997). Another project investigated the stability of target markets for landscape plants over a nine-year period (Turner, 1997). The different outlets analyzed in this study were large retail stores (Kmart, Walmart, etc.), large lawn and garden centers (Pikes, etc.), and local lawn and garden centers. Economic models were developed to identify factors that would explain the percentage of plants purchased at different outlets. The results confirm previous results that different target markets exist for different types of retail outlets for landscape plants. The problem appears to be the lack of stability of the identified target markets. Although some identified factors appear to be significant over a nine-year period, most of the identified segmenting variables did not. This indicates that different markets will continue to exist, and that

different producers can continue to fill those markets. For example, large producers can supply the mass market, while smaller producers can capture more of the consumer dollar by direct marketing.

2.2 New York's Green Industry

New York ranks 10th in floriculture and environmental horticulture cash receipts, down from 5th in 1987. While sales in New York are growing, sales in the South and West are growing faster. New York accounted for 2 percent of U.S. output in 1998 (USDA Economic Research Service, 1999). The green industry is the second largest sector of agriculture in New York State next to dairy, with a production sales value reaching $264 million in 1998 (New York State Department of Agriculture and Markets, 1999). Total sales revenue from New York greenhouse production alone was estimated to be $207 million during 1997 (Uva, 1999). However, as average annual gross receipts from greenhouse businesses showed an increasing trend for the nation, changes in receipts in the Northeastern U.S. in general, and in New York, in particular, have not been as robust over the last decade (Traver, 1998).

New York farmers face competition from non-agricultural industries for land and labor. Land in farms and number of farms in New York decreased 3 percent and 8 percent from 1992 to 1997, respectively (New York State Dept. of Agriculture and Markets, 1999). Because New York has high land and labor costs and a cooler climate than states in the South, New York producers need to focus on high value agriculture like the green industry to remain competitive and preserve farmland. The green industry is usually divided into the floriculture (greenhouse) sector and the environmental horticulture (nursery) sector. The floriculture sector includes cut flowers, cut cultivated greens, potted flowering plants, potted foliage plants, and bedding and garden plants. The environmental horticulture sector includes crops usually grown outdoors and used primarily for landscaping purposes, such as trees, shrubs, ground covers, turfgrass or sod, bulbs, and planting stock (Johnson, 1997).

Uva (2000) showed that the size of greenhouse operations in New York State varied significantly, and bedding/garden plants were the most important product line and accounted for the highest sales. Although the majority of greenhouse producers (79 percent) used retail marketing, wholesale to mass marketers generated the highest total industry sales (45 percent). Using the IMPLAN input-output model, Uva estimated the total output and employment multipliers to be, respectively, 1.552 and 1.334. This means that 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 other sectors of the state economy (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. For every dollar of output generated by the state's greenhouse businesses, $0.552 of additional output resulted through indirect and induced effect; and for every job created at a greenhouse firm, 0.334 additional jobs were generated from the secondary effects.

The green industry has become a major sector within U.S. agriculture and is of major importance to farmers, rural communities, and consumers. The obvious prospect is for continued growth within the green industry.

3.0 MONROE COUNTY GREENHOUSE INDUSTRY SURVEY RESULTS

The green industry is usually divided into the floriculture (greenhouse) sector and the environmental horticulture (nursery) sector. The floriculture sector includes cut flowers, cut cultivated greens, potted flowering plants, potted foliage plants, and bedding and garden plants. The environmental horticulture sector includes crops usually grown outdoors and used primarily for landscaping purposes, such as trees, shrubs, ground covers, turfgrass or sod, bulbs, and planting stock (Johnson, 1997).

This survey was limited to the floriculture (greenhouse) sector. Potential growth also exists for the nursery or environmental horticultural portion of the green industry. The sponsors of this study may wish to examine the nursery industry in subsequent studies.

3.1 Survey Methodology

A mail questionnaire was developed to survey the greenhouse sector of the green industry in Monroe County, New York. This questionnaire was developed with input from the Monroe County Department of Planning and Development in conjunction with Cornell Cooperative Extension of Monroe County. Other surveys were used to develop this questionnaire. These include an unpublished survey of Monroe County greenhouse by Brian Eshenaur and a Pennsylvania Greenhouse Survey (Brumfield, et al., 1993).

Sixty-seven questionnaires were mailed in March 2000 to all greenhouse growers in the Directory of Certified Nurseries, Greenhouses, and Plant Dealers, published by the New York State Department of Agriculture and Markets, Division of Plant Industry in 1999. This list distinguishes greenhouses from nurseries.

This initial mailing was followed by a reminder postcard, and finally, by a second questionnaire. Thirty-six questionnaires were returned yielding a 55% response rate. Of those, 21 were completely filled out, and indicated that they are a commercial greenhouse business. These 21 firms are used for the analysis, representing 26% of the original mailing list. Most of the respondents of the 15 unused returned questionnaires indicated that they did not have a commercial greenhouse. Others on the initial mailing list indicated that they were no longer in business, or are non-commercial firms.

3.2 Business Profile

Annual Gross Sales Volume

The total annual gross sales volume for greenhouse floricultural crops for the 21 respondents to the greenhouse survey in Monroe County, was $6.8 million in 1999. Forty-three percent of the respondents had annual gross sales of $50,000 or less in 1999. The sales from these greenhouses accounted for less than 3% of the total sales in the county. Fourteen percent (3 firms) had annual sales of $1 million or more (Figure 1). Sales from these three firms accounted for two-thirds of the sales volume in the county. The greenhouse industry in Monroe County does seem to closely follow the 80:20 rule (i.e. Twenty percent of the firms account for 80% of the sales). Seventy-six percent of the firms have sales of under $350,000 per year, and make up about 23% of the county's total annual sales. The average annual gross sales per greenhouse firm in Monroe County in 1999 were $326,071, but the median gross annual sales were only $100,000.

In 1997, Wen-Fei Uva surveyed all registered plant growers in New York. The survey was mailed by the New York State Department of Agriculture and Markets, the Division of Plant Industry. In

an unpublished draft, Uva reported the sales for the 29 survey returns from Monroe County of businesses with more than $10,000 in annual greenhouse product sales in 1997. Uva reported total receipts from greenhouse products in 1997of $25.6 million from 29 respondents with sales over $10,000. This would yield an average of $882,759 in annual gross receipts per firm, as compared to $402,794 in gross receipts for the 17 firms with annual sales over $10,000 in this survey. This difference may be because several large greenhouses in Monroe County did not respond to our survey. Both the current study and the one by Uva used the same mailing list. Her higher response rate can probably be explained by the fact that the New York Department of Agriculture mailed her survey, and Monroe County Cooperative Extension Service mailed ours. Producers are required by law to respond to the Census which is also administered by the New York Department of Agriculture, thus producers were probably more motivated to respond to that one, and it also came earlier. Producers may have been tired of being surveyed by the time they received ours.

Monthly Sales Distribution

To identify sales cycles during the year, we asked growers to indicate the percentage of the firm's total annual sales that occur during each month. Not surprisingly, nearly 40% of sales occur during May, which corresponds with bedding plant sales season. June accounts for about 20% of annual sales. Sales for July account for 7.5% of annual sales, followed by April and December with nearly 6% and 5% respectively. All of the other months account for less than 5% of annual sales. Only 5 respondents produce poinsettias, which explains why December sales account for only 5% of annual sales. In general, the relative distribution of sales is about the same for all greenhouse sizes (Figure 2).

Part-Time Versus Full-Time Greenhouse Business

About one fourth (5) of the respondents feel their greenhouse is a part-time business, and about three fourths (16) of the respondents say it is a full-time business (Figure 3). All of the greenhouses that are over 10,000 square feet in size are full-time businesses.

Greenhouse Businesses as a Major Source of Income

Thirteen respondents (62%) derive their major income from their greenhouse (Figure 4). All but one greenhouse over 10,000 square feet in size considers the greenhouse to be their major source of income.

Geographical Sales Area

Seventeen greenhouses (81%) sell their products in the state of New York, three (14%) sell to neighboring states, three (14%) sell to distant states, and two (10%) sell out of the U.S.A. Forty-six percent of total sales of the three respondents who sell their products to other states are to out-of-state customers. The average out-of-country sales of the two export growers are 23% of total sales.

Greenhouse Size

The 21 useable questionnaires returned in this survey account for 452,827 square feet of greenhouse space is devoted to floricultural crops in Monroe County. The average firm size is 21,563 square feet. Monroe County has several small greenhouses and a few fairly large ones (Table 1). Six greenhouses have less than 2,000 sq. ft. of greenhouse space, and four have over 50,000 sq. ft. of greenhouse space. The size ranges from 100 sq. ft. to 80,000 sq. ft. The median size greenhouse is 8,000 sq. ft. The mode is 1,500 sq. ft. The smaller greenhouses tend to be heavily focused on retail sales. The correlation between size and age is positive, but not extremely strong. The largest four greenhouse firms who responded to the survey account for 58% of the greenhouse space and 54% of the sales. Because of their emphasis on retail sales, the

smaller greenhouses account for a larger percentage of sales than total greenhouse area. We know there are about 10 greenhouses that did not respond, including at least several very large ones. If these had responded, the results would more closely match those found in the Uva study.

Change in Size Since 1995

Since 1995, six greenhouses (29%) have increased their size. All four of the largest greenhouses (50,000 – 80,000 sq. ft.) increased in size as did one greenhouse between 5,000 and 9,999 sq. ft. and one between 24,000 and 49,999 sq. ft. Five of these respondents reported the size of the increase, and the average of increase was 16,844 sq. ft. Only one greenhouse (5%) experienced a size decrease. That greenhouse decreased by 4,000 sq. ft. Sixty-six percent of the greenhouses have not changed size since 1995.

Nine firms anticipate expanding their operation within the next five years. Six firms plan to expand their retail operation, 5 firms plan to expand their wholesale operation, 6firms plan to expand their production greenhouses, 3 firms anticipate expanding all three, and one firm plans to expand in unspecified areas.

Age of the Firm

The Monroe County greenhouse firms were established between 1880 and 1998. The age distribution of firms in several categories is seen in Figure 5. The age is fairly evenly distributed. The average age of the greenhouse firms is 32.9 years, and the most common business age reported is 22 years. Twenty percent of the firms are ten years old or younger, and 20% are over 50 years old. Three firms are less than 5 years old. A weak, but positive relationship exists between age of firm and annual sales (Table 2). This would indicate that older firms have had more time to establish markets. However, the fact that four new firms have been created since NAFTA took effect in January 1994 indicates that firms can still compete in spite of increased competition. The greenhouse industry in Monroe County is very dynamic

Legal Structure

The greenhouse firms in Monroe County average only about half an acre in size, which may explain why the majority (71%) is comprised of sole proprietorships (Figure 6). Ten percent are partnerships and 19% are corporations. Only one greenhouse below 25,000 sq. ft. is a corporation, while only one greenhouse above 25,000 sq. ft. is a sole proprietorship. The other larger greenhouses are corporations or partnerships.

Other Farming Operations

Ten firms (48%) are involved in other farming operations besides greenhouse production. These operations include fruits, vegetables (e.g. strawberries and pumpkins), in ground production of plants, hay and straw, and Christmas trees.

Marketing Channel

In Monroe County, the average greenhouse obtains 74.3% of its sales from retail and 25.8% from wholesale sales (Figure 7). Smaller greenhouses tend to have a high percentage of retail sales, and large ones have a high percentage of wholesale sales. Most firms in the county have a combination of wholesale and retail sales, but 6 firms do no wholesaling at all, and three firms do no retailing. Wholesale growers in Monroe County supply 40.5% of their sales to garden centers and 42.5% to others, including farm markets, landscapers, the public market, florists, and hobbyists (Table 3).

The 1997 greenhouse survey of the New York floricultural industry by Uva found that while only 6.9% of greenhouse growers in Monroe County wholesaled to mass marketers, this accounted for

the majority of their sales (Table 4). In our survey, none of the respondents indicated that they sold to mass marketers. The difference in the 1997 and 2000 surveys may represent competition from Canada, which could have forced growers to find less competitive markets, or it could be because several large growers did not respond to the 2000 survey, and these large greenhouse are selling to the mass market.

Retail growers in Monroe County consider large retail chains that are mass merchandisers to be their major competition (Table 5). The next most important competition comes from garden centers. Other competitors are nurseries, farm markets, other growers, and the Public Market.

Wholesale growers consider Canadian growers to be their major competition (Table 6). The next most important source of competition comes from other growers in New York.

Materials Costs

Annual materials costs for growers in our survey ranged from under $5,000 to between $225,000 and $300,000 (Figure 8). When the costs were calculated on a per sq. ft. basis, the greenhouses under 2,000 sq. ft. in size had a much higher costs than the other greenhouse sizes (Figure 9). The average materials cost per sq. ft. is $6.14. The mode is $3.75, and the median is $3.06. The small, specialized growers push up the average materials cost per sq. ft.

Crops

The crops produced by Monroe County growers are quite diverse. Bedding plants are the most commonly produced crop and account for about one third of the sales (Table 7), but 5 respondents do not produce bedding plants. Four of the respondents are specialty growers who grow exclusively one type of crop. These include two growers producing potted plants, one producing perennials, and one producing bonsai. Other potted plants account for 15% of sales, followed by perennials with 11.6% of sales. Poinsettias, the largest potted flowering crop nationally, are produced by only 5 growers in Monroe County. Only one grower produces outdoor cut flowers, a growing national trend. This wide distribution in crops produced indicated that growers in Monroe County are finding niches. The fact that they are not producing large quantities of poinsettias may indicate that they have chosen not to compete head to head with Canadian growers, but instead, buy poinsettias from Canada and grow specialty crops that the Canadians are not growing.

Sixty-two percent of firms produce their own plugs, 47.6% of firms buy pre-finished plants, 81% of firms buy in plugs, 23.8% of firms sell pre-finished plants and 4.8% of firms sell plugs (Table 8). Roughly half of the growers produce their own plugs and also buy in some plugs, and only one grower sells plugs. These statistics suggest that growers are looking at their cost of production, and are taking advantage of the pre-finished and plug markets to supplement what they produce and look for profitable niches that they can fill.

Labor

Annual labor costs for growers in our survey ranged from under $5,000 to between $150,000 and $225,000 (Figure 10). Eight growers responding to our survey (38%) reported annual labor costs of under $5,000, but only 10% (two growers) reported annual labor costs of over $150,000. This distribution reflects the fact that Monroe County has several small greenhouses but only a few large ones.

Figure 11 shows that the smaller growers in our survey spend much more on labor per sq. ft. of greenhouse space than larger growers. Respondents with greenhouses under 2,000 square feet

spend an average of $8.03 per sq. ft. on labor, whereas growers in the 50,000 to 80,000 sq. ft. category spend only $1.84 per sq. ft.

Total Employees

The greenhouse industry is a seasonal business. The average number of employees per greenhouse varies from 1.9 per greenhouse in January, to 5.4 employees per greenhouse in May (Figure 12). This includes full-time, part-time, and seasonal employees. The total number for the respondents of this survey ranged from 40 in January to 114 in May (Table 9).

Since 1995, the number of employees has increased in 24% of firms, has stayed the same in 57% of firms, and decreased in only 5% of firms (Figure 13).

Competition

Most of the greenhouses (81%) in this sample have not investigated plans for expansion by the competition. When asked about their own plans for expansion, five greenhouses indicated that they plan to expand into a niche market. The two niche markets mentioned are African violet production and container gardens.

In response to the open-ended survey question, "What is the greatest deterrent to expanding your greenhouse operation?" respondents indicated: time (4), availability of good hired labor (3), Canadian growers (3), capital (2), market saturation (2), age (of owner)(2), too tired, keeping a handle on quality of the crop, labor cost, fuel cost, regulations, taxes, and cash flow from July through April. In response to the open-ended survey question, "What is the greatest deterrent for the industry expanding in Monroe County?" respondents reported: Canadian growers selling at lower costs (7), competition from mass marketers (3), taxes (2), business costs (2), market saturation (2), taxes (2), low demand for products, regulations, fire codes, and insurance costs. .

Respondents were given a list of factors and asked to rank them according to how much these factors impact their business (Table 10). The most important factor was market demand, which was ranked as very important by nine respondents. Seven respondents ranked their own managerial expertise, production costs and competition as very important. Interestingly, 7 respondents ranked their own managerial expertise as very minor in how it impacts their businesses. The least important factor was the ability to attract and retain competent management. This may be unimportant because they already have management in place, or because they are the manager and feel they are doing a good job or have the skills they need. The ability to attract and retain hourly employees also had a bimodal distribution with five respondents ranking it as very minor and six respondents ranking it as very important. A similar pattern appeared with environmental regulations and other governmental regulations where six respondents ranked these factors as very important, but five ranked them as very minor. One respondent ranked "other" as very important, and wrote in gas and electric costs as this factor. Since energy prices have risen considerably since the survey was conducted, this would probably be a very important factor for many respondents now.

Respondents were given a list of factors and asked to rank them according to how much they impact their ability to grow healthy plants (Table 11). The most important factor was weather followed by water quality. In general, producers think that scheduling crops in the greenhouse or the cultural requirements (i.e. pinching, watering, fertilizing, pest and disease control, lighting, spacing, etc.) of new crops have a very minor impact on their ability to grow plants. Controlling insects has a bimodal distribution with five respondents ranking it as very important and another five ranking it as very minor. A similar pattern exists for controlling weeds and diseases.

Pricing
We asked respondents to rank the importance of a list of factors in price determination (Table 12). Eleven respondents ranked market demand as very important. No respondents considered market demand to be very minor or minor in price determination. Ten respondents ranked production and product uniqueness as very important. These responses indicate that marketing is very important, as well as finding niches, but that competition is putting pressure on prices and forcing producers to reduce cost of production.

Factors Limiting Business Expansion
We asked respondents to rank the importance of a list of factors according to level of importance in limiting expansion (Table 13). Eight respondents ranked capital and personnel as very important limiting factors for the expansion of the business. Eight respondents ranked marketing as important. Transportation was not ranked as very important by anyone, and was ranked as very minor by five respondents. Plant selection was considered a very important factor that limits expansion of the business by five respondents, but was considered a very minor factor in limiting expansion by five other respondents.

3.3 Conclusions Drawn from Survey

The total annual gross sales volume for greenhouse floricultural crops in Monroe County in 1999, for the 21 respondents to the greenhouse survey, was $6.8 million. The average sales per greenhouse firm are $326,095. The industry employs 114 people at the peak production time in May. The average greenhouse in Monroe County is 21,563 square feet in size, selling about ¾ of their product retail, and ¼ through wholesale channels. Bedding plants are the most important crop, but there is a lot of diversity within the county. Even though the average greenhouse is only about ½ acre in size, they are full-time businesses, generating a substantial amount of income. All respondents with greenhouses that are at least ¼ acre in size are full-time businesses for the owner, and are the owner's major source of income.

Further analysis of the survey data suggest that retail growers in Monroe County consider large retail chains that are mass merchandisers to be their major competition, while wholesale growers consider Canadian growers to be their major competition. Despite competition from Canada and preferential advantages afforded Canadian growers since NAFTA took effect in January 1994, the industry is growing and thriving. New firms have been created, and older ones are still in business. Survey results indicate that the years the firms were created range from 1880 to 1997. Six respondents increased the size of their greenhouse operation in the last five years, an average of 16,844 square feet each. Only one firm decreased in size in the last five years, and this decrease was 4,000 square feet. Nine firms plan to expand their operation in the next five years.

When respondents identified the greatest deterrents to expanding their greenhouse operations respondents indicated that business management and marketing issues were much more important than production issues. These deterrents would negatively impact the greenhouse industry by resulting in excess supply. Thus, respondents ranked market demand, their own managerial expertise, production costs, and competition to have the major impacts on their businesses in rank order of importance from a list of choices that they were given. About an equal number of respondents ranked their own managerial expertise and their ability to attract and retain hourly employees as important as ranked it very minor. This suggests that greenhouse managers would learn a lot from each other through management clubs, discussion groups, grower associations, etc.

When asked to rank a list of factors which impact production (the traditional area extension programs emphasize), the uncontrollable factors such as weather and water quality were most important. Crops scheduling, and cultural requirements were not considered very important.

In pricing their crops, producers consider market demand as the most important factor, followed by cost of production and product uniqueness.

4.0 Empirical Analysis of Greenhouse Industry Productivity

The effective utilization of greenhouse space is one critical determinant of grower profitability. In order to achieve high sales per square foot of space, a grower must maintain the proper level and mix of crops, thereby realizing high turnover rates and healthy margins. Higher sales per square foot in a greenhouse are usually associated with higher profits (Strain and Hodges, 1987). Using the results of the survey, it is possible to identify a number of factors associated with the attainment of high space productivity.[1]

Measuring Firm Profitability

The space productivity of a firm can be measured by its sales per square foot. Each firm's sales per square foot can be calculated by taking its annual sales (Question 31) and dividing it by its square feet of production area (Question 8). For all the cases in the survey, the midpoint of sales per square foot was $25. Using this midpoint, firms were divided into two groups, those with sales above $25 per square foot and those below that point.

Factors Affecting Firm Profitability

There are a number of factors likely to affect firm profitability, including the age of the business, the legal structure, the cost of materials and supplies, whether the firm includes a retail business, and whether the firm is the major source of income for the grower.

The firm's degree of diversification may also have a positive impact on profitability.[2] Diversification versus specialization is an important element in understanding the structure of the greenhouse industry in Monroe County, New York. Related diversification occurs when the greenhouse firm participates in synergistic enterprises that is enterprises among which managers can easily transfer their skills. In this study, we use Herfindahl and Entropy Indexes as scale measures of diversification or specialization. Indexes of firm diversification provide us with an idea of the number of crops a greenhouse produces and the relative importance of each crop to the firm. These indexes have a continuous range between 0 and 1.

The Analysis

The logit model was selected as a regression method since it is commonly used in settings where the dependent variable is binary. Because the data are individual firms rather than aggregate

observations, the appropriate estimation method of choice is the maximum likelihood method.[3] Due to a few growers not answering some of the questions associated with variables in the estimation, the sample size was reduced to 20 observations. The parameters of all models are estimated using cross-sectional firm-level data and SAS/ETS statistical package. An initial

[1] Productivity refers to the efficiency of the operation of the greenhouse business. It is when each production unit is utilized at peak efficiency that revenues are increased, expenses contained and profitability maximized

[2] The relationship between diversification and profitability has been the subject of considerable research, with varying results. Rumelt (1974), Montgomery (1985) and Palapu (1985) found a positive relationship between firm performance and related diversification due to synergy, scale economies in production and marketing, or market power. Arnould (1969) and Markham (1973) found no significant positive relationship between diversification and firm performance. More recent research by Ding et al. (1997) does not lend strong support to the diversification-performance relationship suggested by the previous studies.

[3] Among the beneficial characteristics of maximum likelihood method are that the parameter estimates are consistent and asymptotically efficient.

regression was estimated using all independent variables except those related to greenhouse firm diversification or specialization (Herfindahl and Entropy Indexes). After evaluating the overall fit of the initial model along with each variable's coefficient sign and significance, insignificant variables were deleted in order to explore the impacts of diversification measures on the average greenhouse firm productivity. See the Appendix for further discussion of the model, firm diversification theory and scale measures.

The Findings – Model #1

The first model analyzes the affect of the following variables on space productivity:

- The age of the greenhouse firm (AGE_i)
- The cost of materials and supplies ($MATSALES_i$)
- The legal structure of the greenhouse firm, whether it is a sole proprietorship or otherwise ($SOLE_i$)
- The firm's reliance on retail, measured by whether the firm obtains at least 50% of its sales from a retail operation ($RETAIL_i$)
- Whether the greenhouse is the major source of income for the firm ($INCOME_i$)
- The diversity of production at the greenhouse, as measured by the Herfindahl Index ($HFINDEX_i$).

The findings of this first model are summarized in Table 15. The independent variables explain 76% of the variation in the productivity of greenhouse firms.

A number of variables had a negative impact on the probability that a grower would have high space productivity (sales per square foot of $25 or more). A higher cost of materials and supplies was negatively associated with space productivity. Likewise, a sole proprietorship structure, and a firm's reliance on the greenhouse as the major source of income were negatively associated with productivity.

There are also several variables in this first model that were positively associated with high space productivity. Firms that were more reliant on retail were more likely to have high space productivity, as were firms that scored high in specialization on the Herfindahl Index. The age of the firm was also positively associated with space productivity, but the impact was not as great.

The Findings – Model #2

A second model was created using an alternate measure of product diversity. While the first model used the Herfindahl Index to measure diversity, the second model used an Entropy Index to measure diversity ($ENTROPY_i$). The other variables present in the first model (AGE_i, $MATSALES_i$, $SOLE_i$, $RETAIL_i$, $INCOME_i$) are also included in this second model.

The independent variables in this second model explain 51% of the variation in the productivity of greenhouse firms. All the variables included in the first model have the same direction of causality. However, increasing product diversification as measured by the Entropy Index has a negative impact on the probability of high space productivity. This is consistent with the first model with respect to variable $HFINDEX_i$. The negative and significant impact of related diversification on greenhouse firm performance is expected and consistent with the findings of several other diversification-performance studies (Arnould, 1969; Markham, 1973), which found no significant positive relationship between diversification.

As in the first model, reliance on a retail operation for at least 50% of sales had a positive association with space productivity. In the case of this second model, this relationship was also

statistically significant. The age of the firm was also positively associated with high space productivity, but the impact was relatively small and just beyond the range of statistical significance.

Other findings also reflected those in the first model. The cost of materials and supplies had a strongly negative impact on the likelihood a firm would have high space productivity. A sole proprietor structure and reliance on the greenhouse as a major source of income for the firm were also negatively associated with space productivity.

5.0 CASE STUDIES

5.1 New York

In addition to statistical data, I spoke with Ralph Freeman, retired county agent from Long Island, and Karen Dean Hall, Extension Educator, CCE of Erie County, Margery Daughtrey, Senior Extension Associate, Plant Pathology, Long Island Horticulture Research & Extension Center, as well producers and numerous people in Cornell Cooperative Extension, the Monroe County Department of Planning and Development, and Farm Credit to get a picture of the greenhouse industry in the key production centers in New York.

The centers of the green industry in New York in order of importance are:

1. Long Island – Suffolk County
2. Erie County
2. Orange County
3. Monroe County

Long Island
The 1998 Census of Horticultural Specialties reported that Suffolk County, Long Island had 180 commercial operators and $697,667 in average sales per operation (Table 14). These figures are more than triple the size of the Monroe County statistics. Wholesale operations in Suffolk County represented 71% of the commercial operations, and 88.5% of the sales were wholesale sales. This contrasts with Monroe County, which reported having only 51% wholesale operations, and only 24.5% of the sales from wholesale transactions.

Long Island had favorable weather (high light, moderate temperatures, and adequate rainfall), a large, high-income population base, and strong extension programs in horticulture. Long Island greenhouse businesses can be classified into three major types. The very largest growers sell to the mass market stores, such as Home Depot and K-Mart, where products compete on price. The medium sized growers try to grow something slightly different from what the mass markets sell. They tend to sell of upscale garden centers, where clients pay for high quality. Products include Proven Winners and large pots for patios. The smaller growers find a unique niche and focus on marketing. Niches include specialty annuals, Phalaenopsis, and herbs.

Long Island has a strong extension program that is well staffed. Most of the funding comes from county sources, user fees, and grants. Extension has a strong relationship with county officials and legislators, who support extension programs.

Erie County
Erie County reported a high percentage of wholesale operations (64%), and 77.4% of greenhouse sales are wholesale in the 1998 Census of Horticultural Specialties. The sales per operation averaged $367,266 per operation in the 1998 Census of Horticultural Specialties, nearly double the sales per operation in Monroe County. The operations in Erie County were very labor intensive, with payroll accounting for 47.5% of sales.

Erie County has an active floricultural advisory group of 20 to 30 professional flower growers who meet frequently meet for dinners to plan grower meetings. Erie County has a quarterly newsletter that goes to greenhouse owners.

Monroe County

In the 1998 Census of Horticultural Specialties greenhouse operators in Monroe County reported a lower percentage of wholesale operations and a much lower percentage of wholesale sales than other key floricultural areas of the state. Monroe County reported that only 51% of their operations were wholesale and only 24.5% of sales were wholesale. Monroe County also had lower sales per greenhouse than Suffolk, Erie, or Orange Counties. Monroe County operators reported a relatively lower payroll than other key production areas. Payroll for Monroe County was only 23.8% of sales. Their focus on retail is probably appropriate given their proximity to a high-income population, and the competitive pressure from wholesale growers in Canada.

Both Long Island and Erie County have stronger grower organizations than does Monroe County. The producers in Suffolk and Erie County seem willing to share information with each other and attend extension meetings. Monroe and Erie County have a cooperative arrangement where Karen Dean Hall covers the greenhouse industry for both Erie and Monroe County, and Brian Eschenaur covers turf for both counties. Monroe County charges a fee to be a member of extension and receive mailings, meeting notices, and publications. Notices of meetings go out to other growers as well. Monroe County does not have an active grower association, and producers tend not to attend extension meetings. In spite of a very timely program offered on energy conservation in November 2000, only 4 growers from Monroe County attended.

The major concerns are competition from Canadian producers, especially since NAFTA, and over saturation of the market, primarily from chain stores.

5.2 Michigan

Michigan has three major centers of greenhouse production: the Detroit area, Ottawa County, and Kalamazoo County. Each of these areas has more greenhouse operations, higher sales per operation, a higher percentage of wholesale operations, a larger percentage of wholesale sales, and a higher percentage of sales spent on payroll than Monroe County.

I spoke with Dr. Bridget Behe, Associate Professor, and Dr. Wil Carlson, Professor and Distinguished Faculty Member, Department of Horticulture, Michigan State University to learn more about why these areas developed as centers of production. The Kalamazoo bedding plants industry grew out of a changed vegetable industry. They are close to a large population center, thus the demand, and as food sourcing changed so did the growers.

Michigan has a strong extension program in the local centers of production and state-wide. There is a great deal of cooperation and two-way support between the industry and the university/extension. Growers cooperatively fund research at Michigan State to solve the problems of the industry. This appears to be driven by competent, charismatic faculty as well as the industry itself. Bedding Plants International, a nationwide grower organization had its beginnings in Michigan largely through the efforts of Wil Carlson and his relationship with the industry. Growers fund research at Michigan State University, and thus have a say in what types of research is conducted, and ensuring that it addresses their needs.

5.3 Canada

Although Canadian growers are further north than Monroe County growers and may face more heating requirements, poorer lighting conditions, and further distances from U.S. markets than growers in Monroe County, the Canadian greenhouse industry has continued to grow over the past two decades. In 1998, total sales increased 7.7% to reach $1,189 million. However, the total

area used for greenhouse production increased by only 0.2%, to 3,192 acres. Revenues generated from the sale of flowers and plants increased by 7.3% to $904 million from $834 million in 1997. Ontario continues to account for the largest proportion of these sales at 51.7%, followed by British Columbia with 22.7%, and Quebec with 11.8%. Sales to wholesalers account for 25.4% of total flower and plant sales followed by 21.4% sold directly to the public. In 1998, the vegetable share of total greenhouse sales decreased to 24%. The sale of vegetable bedding plants increased dramatically by 37.2% from 254 million plants in 1997 to 348 million plants in 1998 (Prange and Dean, 2001).

Several producers in Monroe County felt that the Canadians are unfairly subsidized and American growers are not. I interviewed some of the Canadian growers to get their insight on the success of Canadian floriculture. I obtained a list of 10 Canadian growers from a representative of Yoder Brothers, the largest propagator of chrysanthemums in the world. Yoder Brothers has a Canadian production facility. I spoke with several of these Canadian growers to gain insights into their reasons for success in the U.S. market. Keys to Canadian success from the viewpoint of Canadian growers are:

- Many of the Canadian growers are Dutch immigrants who focus on cost cutting measures, automation, and efficient production so they can compete in price competitive markets.

- Canadian growers have formed an energy co-op of growers so they buy their energy cooperatively, and the price is fixed for the season, thus keeping this input cost low.

- Most producers are very large relative to Monroe County growers, so they get economies of scale.

- Canadian growers produce few crops, so they can specialize and automate, keeping costs down.

- The U.S. market is huge, and the industry is booming, so the market is expanding with more people willing to buy floricultural crops.

- Some of the Canadian growers specialize and buy product from other growers rather than producing everything themselves.

- Canadian producers focus on the mass market, but some of them sell to supermarkets where prices are not as competitive rather than the huge mass markets like WalMart where prices are more competitive.

- NAFTA, which took effect in January 1994, gives Canadian growers easy access to U.S. markets.

- The current exchange rate with a strong U.S. dollar is favorable for Canadian growers who are selling in the U.S.

- Canadian growers focus on improving the quality so that the market can continue to expand.

- Canadians try to make contracts at the beginning of the season.

- Canadian producers are always looking for new crops with higher profit margins. They find it difficult to make money on crops like pot mums where competition is stiff.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The total annual gross sales volume for greenhouse floricultural crops in Monroe County in 1999, for the 21 respondents to the greenhouse survey, was $6.8 million. The average sales per greenhouse firm are $326,095. The industry employs 114 people at the peak production time in May. The average greenhouse in Monroe County is 21,563 square feet in size, selling about ¾ of their product retail, and ¼ through wholesale channels. Bedding plants are the most important crop, but there is a lot of diversity within the county. Even though the average greenhouse is only about ½ acre in size, they are full-time businesses, generating a substantial amount of income. All respondents with greenhouses that are at least ¼ acre in size are full-time businesses for the owner, and are the owner's major source of income.

Further analysis of the survey data suggest that retail growers in Monroe County consider large retail chains that are mass merchandisers to be their major competition, while wholesale growers consider Canadian growers to be their major competition. Despite competition from Canada and preferential advantages afforded Canadian growers since NAFTA took effect in January 1994, the industry is growing and thriving. New firms have been created, and older ones are still in business. Survey results indicate that the years the firms were created range from 1880 to 1997. Six respondents increased the size of their greenhouse operation in the last five years, an average of 16,844 square feet each. Only one firm decreased in size in the last five years, and this decrease was 4,000 square feet. Nine firms plan to expand their operation in the next five years.

Producers indicated that the major factors that deter expansion of the industry are related to business and marketing, primarily competition from Canada and mass marketers, cost of production (especially labor and fuel), regulation, market saturation, their own managerial ability, and cash flow problems resulting from seasonality of the business.
When asked to rank a list of factors which impact production (the traditional area extension programs emphasize), the uncontrollable factors such as weather and water quality were most important. Crops scheduling, and cultural requirements were not considered very important.

In pricing their crops, producers consider market demand as the most important factor, followed by cost of production and product uniqueness.

Results of the empirical analysis showed that increasing diversification has a negative impact on the sales per square foot of greenhouse space. This suggests that while some degree of diversification reduces market risk, too much diversification has a negative impact on profitability. Producers should attempt to specialize and perhaps buy in product from lower cost producers to supplement what they produce.

Case Studies
Long Island is a center of greenhouse production. Their success is due to a combination of factors including weather, wealthy population, and a strong extension program. Michigan is another successful greenhouse producing area that has a large population center, a strong extension program, and a history of grower organizations that fund research and educational meetings. Canada is a growing center of greenhouse production that is giving U.S. growers considerable competition. Canadian success include NAFTA; favorable exchange rate; Dutch immigrants in the industry who brought in the concepts of specialization, automation, cost control, pre-selling on a contract basis, and cooperative buying of energy. The Monroe County producers who are successful despite competition from Canada seem to be the ones who don't compete head on, but instead find niches that the Canadians don't serve. Some of them also buy the cheap, generic plants from the Canadians then grow other high value crops.

The greenhouse growers in Monroe County who are successfully competing against the Canadians seem to be the ones who don't compete head on, but instead find niches that are not served by the Canadians. Some successful producers in Monroe County use the cheaper Canadian products to their advantage by buying the cheap, generic plants from the Canadians and growing other high value crops.

Monroe County producers have the advantage of a high-income population center, as do Long Island and Michigan. They have Cooperative Extension and the Monroe County Division of Planning interested in their concerns. This seems a key time to strengthen cooperation between these agencies and producers, and to develop a strong grower organization to offer training and perhaps cooperative marketing and purchasing services for producers.

Summary of Trends

- The industry is growing at a rate of about 5% per year after a rapid growth of 10% annual in the 1980s, but the rate has slowed down, indicating that the industry is now a mature market. Producers will have to be more competitive than in the past to survive.

- Bedding plants are still the major crop in the region accounting for about one-third of sales, but there are several specialty growers. Each producer is unique and appears to have found a specific niche that keeps them competitive.

- The greenhouses in Monroe County are fairly small (21,563 square feet in size) and the focus is on retail (3/4 of sales are retail).

- The focus on retail, and thus high sales per square foot of production mean that greenhouses that are at least ¼ of an acre in size are full-time businesses for the owner, and are the owner's major source of income.

- Business that have identified a niche market and are somewhat specialized have higher sales per square foot that less specialized, highly diversified producers.

- The business is very seasonal with the month of May, the prime bedding plant season accounting for 40% of sales.

- The ratification of NAFTA in January 1994 has given Canadian growers just across the border easy access to U. S. markets, and has made competing profitably more difficult for wholesale growers in Monroe County.

- The growth of mass merchandisers and consolidation is resulting in market saturation and is putting downward price pressure on all producers. Thus there is a need to focus on quality, service, and locally produced products and other marketing tools as well as looking for ways to decrease cost of production.

- The recent increase in fuel prices, the potential of another increase in minimum wages, and a slowing economy all put pressure on producers to look for ways to reduce costs and control debt so that they can survive a possible economic downturn. This program could address concern that some producers expressed in visits to Monroe County for a need for affordable crop insurance.

- The USDA has targeted the Northeast as an under served area for crop insurance. The new Adjusted Gross Revenue crop insurance program was particularly developed for specialty crops such as greenhouse crops.

6.1 Recommendations for Producers

- Look for energy conservation measures such as energy curtains and look at locking in fuel purchases or having convertible boilers so they can switch fuels if the relative price changes.

- Consider automation and other ways to reduce labor and other costs. Labor costs are relatively low in Monroe County compared to other locations, but many producers are worried that minimum wages may go up.

- Attend courses on labor management to help get the most production out of the labor force.

- Do not compete directly with Canada, but instead produce sizes of product, and different products that they don't grow, grow value added products, and look for markets they can't service as well. Buy in plants from Canada that they grow cheaper than the cost of production in Monroe County.

- Look for retail opportunities such as value added. Adding services and different types of plants is generally welcome by high-income consumers. Pre-planting dish gardens, planters, and moss-lined hanging baskets are some examples of this that some producers in Monroe County are already doing.

- Look for niche markets. Most producers in the County are already doing this and have found crops that are unique to their operation, or that they produce better than the competition. Learn to listen to customers to pick up on these markets. Also look to sources such as Martha Stewart to spot trends.

- Buy some crops from Canada and resale them, while specializing in higher value crops.

- Increase market demand by promoting locally grown, point-of-purchase promotions, etc.

- Consider forming grower discussion groups to share managerial as well as production advice. The bimodal responses from growers on factors that impact how they grow healthy plants suggest that growers can benefit from talking to each other.

- Increase business management expertise by taking part in training programs.

- Reduce debt if possible, or secure an operating line of credit to get through this season. Debt is necessary for capital improvements and operating costs, but producers with too much debt cannot weather a financial storm as well as those with lower debt. Work with lenders and accountants to analyze your situation.

- Look into purchasing Adjusted Gross Revenue Crop insurance as a way of reducing uncontrollable risks.

6.2 Recommendations for Cornell Cooperative Extension and Monroe County Department of Planning and Development

- Designate or hire someone to work specifically with the green industry.

- Continue cooperative arrangements between Cooperative Extension and the Department of Planning and Development and other agricultural agencies and surrounding counties to develop educational programs.

- Develop a green industry advisory committee consisting of extension and county staff as well as growers to create a grower organization for the county and delivery programs that address grower's needs.

- Focus education efforts on marketing, business management, and labor management. Cornell has excellent programs in labor management and greenhouse management. Utilize these resources as well as bringing in outside expertise as needed.

- Develop energy conservation methods and extension programs on energy conservation. This is a particularly pressing issue now and should be a good program to revitalize the industry participation in extension programs.

- Develop programs on debt reduction, cash flow management, and capital management. These types of programs will help growers compete with Canadian producers and the mass market as well as survive an economic downturn.

- Provide subsidies or tax breaks for energy conservation or for paying the heat bills in greenhouses along the lines of the energy conserving appliance rebate being given to consumers by the state. If the county cannot offer these programs, work to have the state develop a rebate program for farmers.

- Focus on cash flow management and courses on this so they producers can weather energy price increases.

- Marketing emphasis to find niches where they can charge higher prices to cover the costs. Grower panels showcasing how some growers are doing this successfully would help build a grower organization, and help grower help others. There are already many successful such producers in the county.

- Use New York FarmNet programs to help transition new producers into the business as older ones retire.

- Provide estate planning to help businesses continue.

- Work to promote locally grown programs and encourage state efforts in this direction.

- Provide programs in helping greenhouse owners determine their costs of production. Since most growers produce a multitude of crops, the often don't know which ones are profitable. The empirical analysis suggests the productivity would increase by reducing the number of crops produced. Analyzing costs would help them determine which ones to drop and instead purchase from other growers.

- Continue to offer courses in production and new crops so that producers can compete on quality.

- Work closely with Cornell's Greenhouse Horticulture Work Team to make sure problems in Monroe County are addressed and that the results of the efforts are disseminated to producers in Monroe County via publications and extension programs.

6.3 Funding Sources

Possible funding sources for producers seeking to invest in energy saving technology include:

- New York State Department of Ag. and Markets, Thomas, Lindberg, Ag Energy Pilot Project, 518-485-7728.
- New York State RITA (Energy Research and Development Authority, www.NYSERDA.ORG.

Possible funding sources for Monroe County Cooperative Extension Service and Monroe County Division of Planning include:

- Raise registrations/fees for programs/services for growers.
- Farm Credit/Farm Bureau/other agricultural support industries.

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TABLES

Table 1. Number, size, and sales of Monroe County greenhouses by size category.

Size category (sq. ft.)	Total greenhouses		Total greenhouse space		Total sales	
	No.	percent	(sq.ft.)	percent	$	percent
Under 2,000	6	29	4,568	1	433,000	6.3
2,000-4,999	2	10	4,000	1	22,500	0.3
5,000-9,999	3	14	23,500	5	1,555,000	22.7
10,000-24,999	2	10	30,000	7	137,500	2.0
25,000-49,999	4	19	126,181	28	1,000,000	14.6
50,000-80,000	4	19	264,578	58	3,700,000	54.0
Total:	21	100	452,827	100	6,848,000	100.0

Table 2. Average age of Monroe County greenhouse firms by annual gross sales category.

Annual gross sales income ($)	Average age of firm (years)	Number of firms
Under $10,000	32.0	4
$10,000-$24,999	30.4	3
$25,000-$49,999	3.5	2
$50,000-$149,999	25.0	3
$150,000-$249,999	27.0	1
$250,000-$349,999	36.3	3
$350,000-$449,999	43.5	2
$450,000-$999,999	-	0
$1,000,000-$1,999,999	22.5	2

Table 3. Marketing channels used by wholesale greenhouse firms in Monroe County.

Marketing Channel	Wholesale growers using this channel	Wholesale sales going through this channel	Estimated sales value in this marketing channel
Large retail chains - Mass Merchandisers	0	0 %	
Retail firms – Garden Centers	7	40.5%	$2,388,000
Retail firms – Supermarkets	0	0%	
Other[1]	6	38.6%	$1,158,750

[1] Farm Markets, landscapers, public market, florists, hobbyists, and village auction.

Table 4. Marketing channels used by greenhouse businesses in Monroe County (Uva, 1997).

Marketing Channel	Growers used this channel	Estimated sales value via this channel
Wholesales to florists	20.7%	$3,257,000
Wholesales to garden centers	44.8%	$4,952,000
Wholesales to mass marketers	6.9%	$12,406,000
Wholesales to other growers	37.9%	$3,447,000
Retail sales	82.8%	$1,572,000
Sales to landscapers	3.4%	$10,000
Sales to brokers	0.0%	$0

Table 5. Percent of retail growers in Monroe County rating the importance of each type of competitor for their greenhouse firms.

Competitor	Strongly Agree	Agree	Disagree	Strongly Disagree	No Response
Large retail chains - Mass Merchandisers	42%	32%	0%	5%	21%
Retail Firms - Garden Centers	21%	47%	5%	5%	21%
Retail Firms – Supermarkets	5%	47%	11%	5%	32%
Other	16%	16%	0%	0%	68%

Table 6. Percent of wholesale growers in Monroe County rating the importance of each type of competitor for their greenhouse firms.

Competitor	Strongly Agree	Agree	Disagree	Strongly Disagree	No Response
Growers in New York	17%	17%	6%	0%	61%
Growers in other states	6%	17%	6%	0%	72%
Growers in Canada	39%	6%	0%	6%	50%
Other	6%	0%	0%	0%	94%

Table 7. The number of growers in Monroe County and approximate percentage of total sales for each crop.

Crop	Respondents producing this crop	Approximate percentage of total sales
Bedding plants	16	33.4%
Hanging baskets	15	8.1%
Geraniums	14	8.0%
Perennials	12	11.6%
Other potted plants	9	17.0%
Pot mums	8	2.0%
Other crops	5	8.6%
Herbs	5	3.0%
Poinsettias	5	1.6%
Outdoor cut flowers	1	0.2%

Table 8. Number and percentage of growers specialized in categories of bedding plant production and pre-finished plants.

Category	Number	Percent
Produce your own plugs	13	61.9%
Buy plugs	17	81.0%
Both produce and buy plugs	10	47.6%
Sell plugs	1	4.8%
Buy pre-finished plants	10	47.6%

Table 9. Average number of full-time, part-time, and seasonal employees per greenhouse per month and total full-time, part-time, and seasonal, and total employees for Monroe County per month.

Month	Average per greenhouse				Total in Monroe County			
	Full-time	Part-time	Seasonal	Total	Full-time	Part-time	Seasonal	Total
January	1.2	0.5	0.2	1.9	25	11	4	40
February	1.2	0.9	0	2.1	26	18	0	44
March	1.7	1.9	0.5	4.1	35	40	11	86
April	1.7	2.1	0.8	4.6	35	45	16	96
May	1.8	2.5	1.1	5.4	38	53	23	114
June	1.7	2.0	1.0	4.7	36	43	20	99
July	1.6	1.1	0.4	3.1	34	24	9	67
August	1.6	1.1	0.4	3.1	34	23	9	66
September	1.6	1.1	0.4	3.1	34	24	9	67
October	1.6	1.0	0.7	3.3	34	20	14	68
November	1.4	0.6	0	2.0	30	13	0	43
December	1.2	0.6	0.2	2.0	26	13	4	43

Table 10. Number of respondents ranking factors according to how much they impact business.

Factor	Ranking				
	Very Minor	Minor	Neutral	Important	Very Important
Ability to attract and retain competent management	8	1	4	2	3
Ability to attract and retain hourly employees	5	2	2	3	6
Own managerial expertise	7	1	2	2	7
Market demand	1	1	3	6	9
Capital	3	2	3	6	6
Production costs	2	0	3	8	7
Competition	3	3	4	5	7
Zoning regulations	5	3	5	3	4
Environmental regulations	5	2	3	4	6
Other governmental regulations	5	1	4	4	6
Weather uncertainty	4	5	2	6	3
Other (gas and electric costs)	0	0	0	1	1

Table 11. Number of respondents ranking factors according to how much they impact their ability to grow healthy.

Factor	Ranking				
	Very Minior	Minor	Neutral	Important	Very Important
Controlling insects	5	2	3	4	5
Controlling diseases	4	3	6	1	6
Controlling weeds	4	3	5	5	3
Water quality	3	0	6	4	7
Weather	2	2	4	4	8
Cultural requirements of new crops	5	4	3	5	3
Scheduling crops in the greenhouse	7	3	3	3	3
Incorporating new technologies for growth	4	5	5	2	4
Other	0	0	0	1	0

Table 12. Number of respondents ranking factors according to level of importance in price determination.

Factor	Ranking				
	Very Minor	Minor	Neutral	Important	Very Important
Cost of production	1	1	0	8	10
Inflation	0	2	8	6	3
Other grower's prices	3	0	6	7	3
Grade of plants	2	0	4	5	8
Market demand	0	0	2	6	11
Product uniqueness	1	0	2	6	10
Inventory levels	2	0	8	7	2
Last year's price	3	0	7	8	2
Other	0	0	0	0	1

Table 13. Number of respondents ranking factors according to level of importance in limiting expansion.

Factor	Ranking				
	Very Minor	Minor	Neutral	Important	Very Important
Capital	3	3	3	3	8
Marketing	3	1	2	10	3
Personnel	3	2	3	3	8
Production	2	2	6	5	4
Transportation	7	3	5	4	0
Plant Selection	5	1	1	6	5

Table 14. Number of operations, sales, wholesale sales, and payroll for selected states and counties.

Location	Number of Operations	Percent that are Wholesale Operations	Sales per Operation	Percent of sales that are Wholesale	Payroll as a Percent of Sales	Percent of operations that Hire Labor
Michigan	1216	71.4%	$387,928	70.6%	49.4%	86.2%
Detroit area	225	67.1%	$412,564	57.7%	30.9%	81.8%
Ottawa	129	86.0%	$656,791	74.5%	37.1%	89.1%
Kalamazoo	73	84.9%	$648,164	83.2%	31.6%	94.5%
Pennsylvania	1387	75.8%	$443,557	88.7%	32.0%	78.7%
New York	985	63.0%	$270,238	72.9%	33.0%	81.7%
Suffolk	180	71.1%	$697,667	88.5%	37.6%	92.2%
Erie	64	78.1%	$367,266	77.4%	47.5%	87.5%
Orange	59	61.0%	$244,508	74.1%	22.9%	81.4%
Monroe	47	51.1%	$191,255	24.5%	23.8%	80.9%

Table 15. Maximum Likelihood Estimates of Logit Model with Herfindahl Index

Variable	Coefficient	Std. Error	Chi Square	Prob> Chi Value square
Age of the Greenhouse Firm *(AGE)*	0.0700	0.0454	2.3733	0.1234
Total cost of materials and supplies *(MATSALES)*	-25.3911	13.4318	3.5735	0.0587*
Legal Structure of the firm; sole proprietorship or otherwise *(SOLE)*	-2.9326	3.0648	0.9156	0.3386
At least 50% of firm sales from retail operation *(RETAIL)*	2.6805	2.5129	1.1379	0.2861
If the greenhouse firm is the major source of income or otherwise *(INCOME)*	-5.5121	3.2239	2.9233	0.0873*
Herfindahl Index *(HFINDEX)*	8.7423	4.8929	3.1924	0.0740*

* Denotes a parameter significantly significant at the 10% level.

FIGURES

Figure 1. Annual gross sales for Monroe County greenhouse firms in 1999.

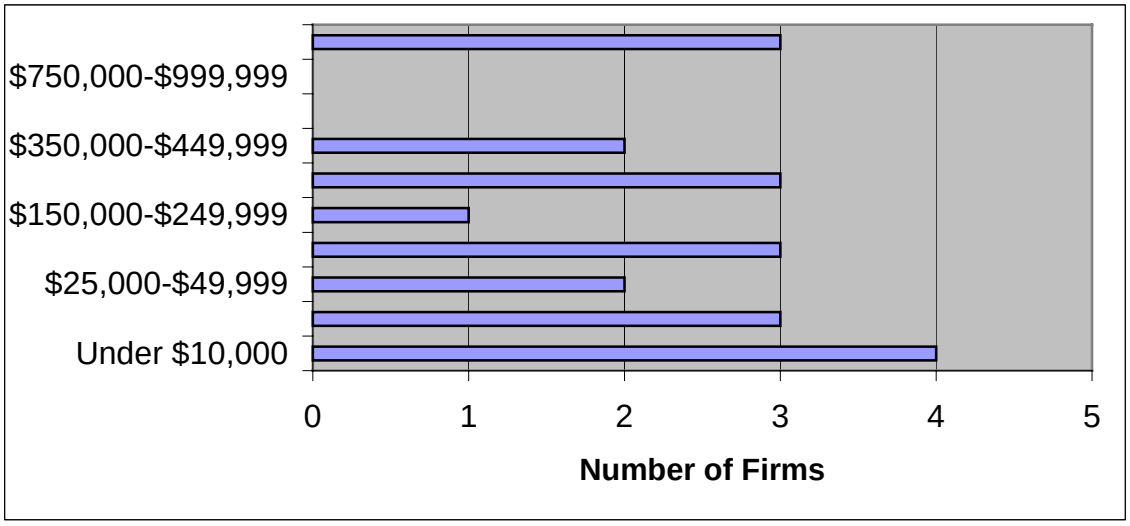


Figure 2. Percentage of average Monroe County greenhouse total annual sales each month.

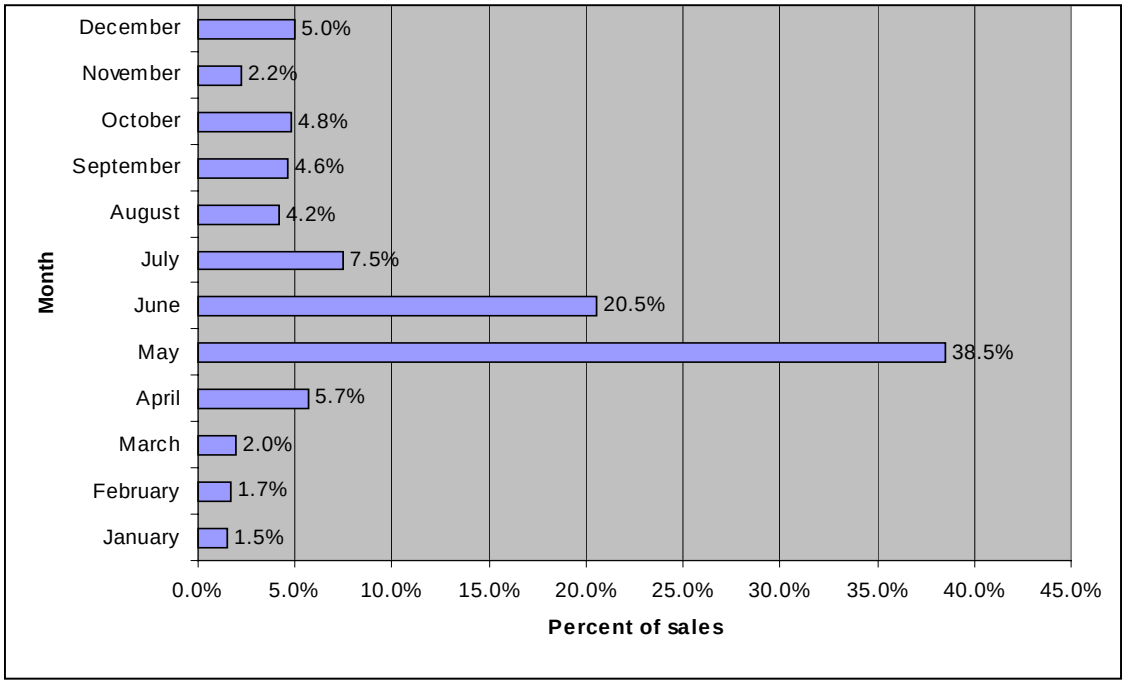


Figure 3. Percentage of full-time and part-time firms in Monroe County.

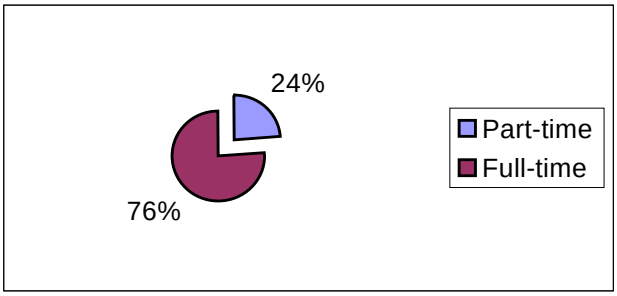


Figure 4. Percentage of Monroe County greenhouses that provide major source of firm's income.

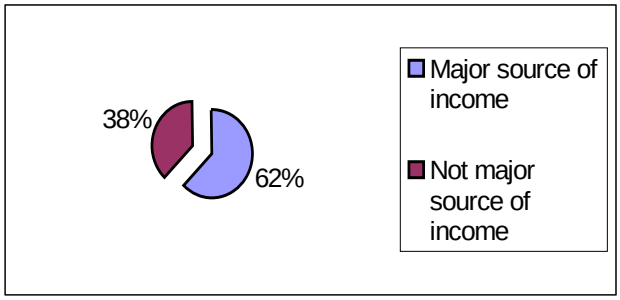


Figure 5. Age distribution of greenhouse firms in Monroe County.

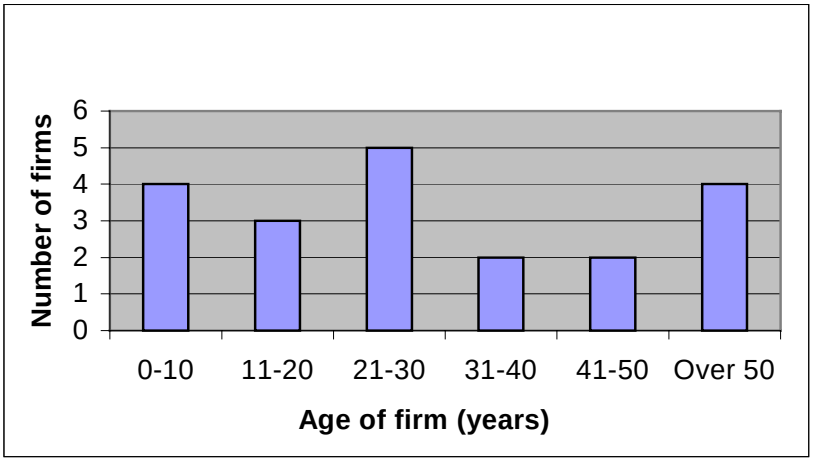


Figure 6. Legal structure of greenhouse firms in Monroe County.

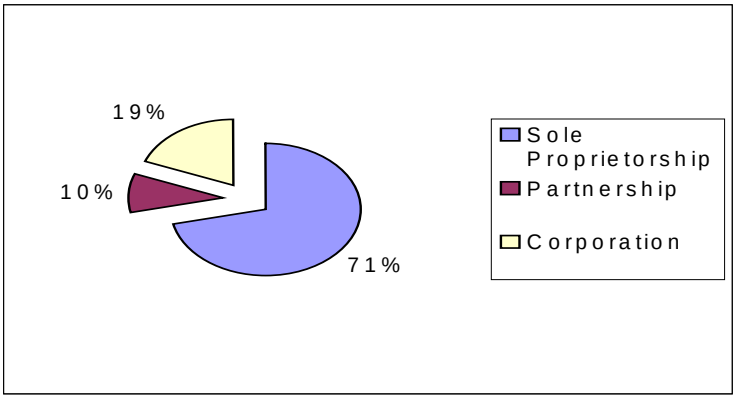


Figure 7. Distribution of the percent of sales from individual greenhouse firms that come from wholesale and retail sales.

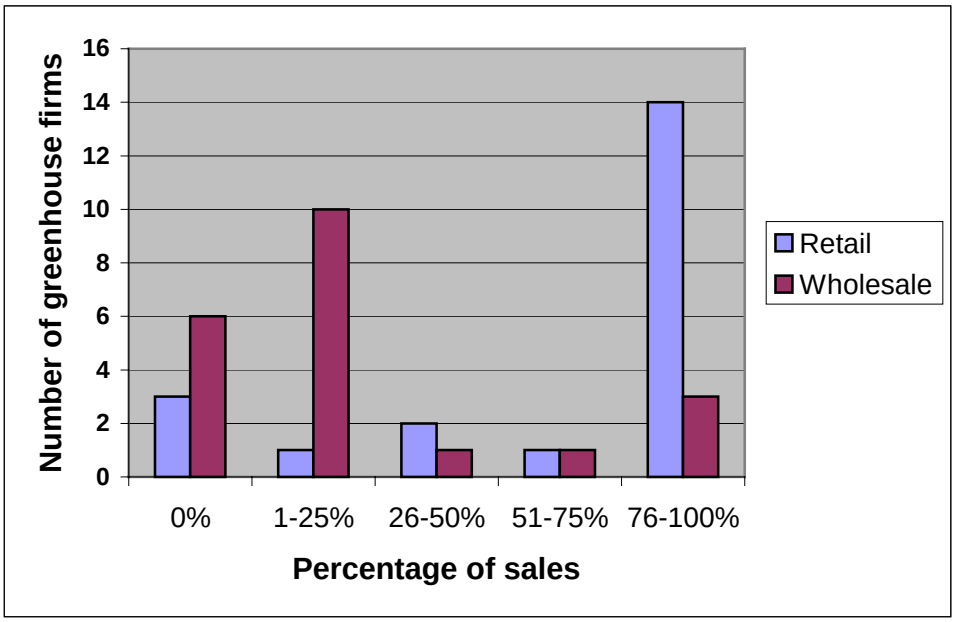


Figure 8. Average annual materials cost of Monroe County greenhouse firms in 1999.

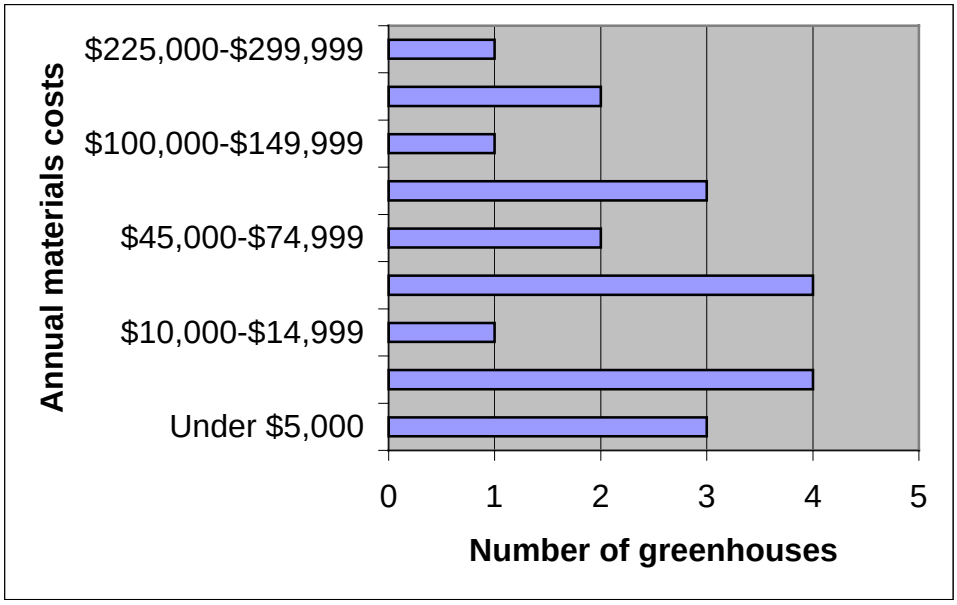


Figure 9. Average materials cost per square foot by greenhouse size in Monroe County.

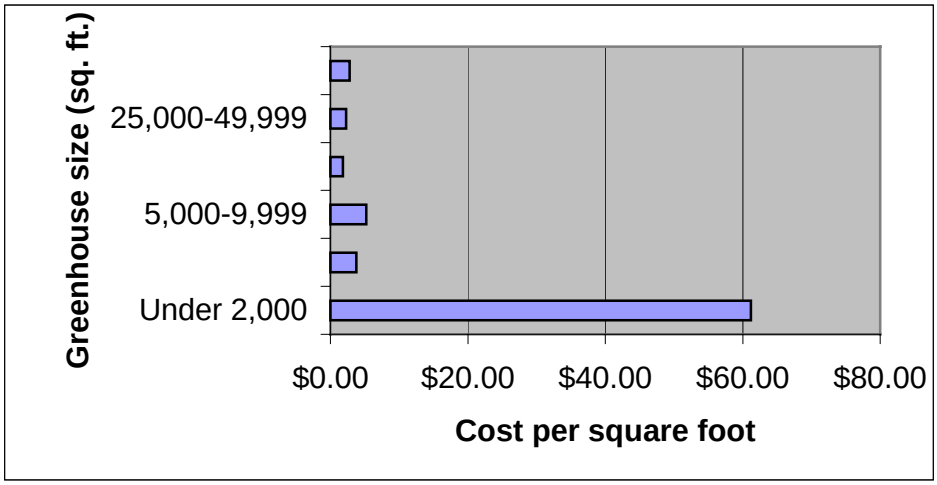


Figure 10. Average annual labor costs of Monroe County greenhouse firms in 1999.

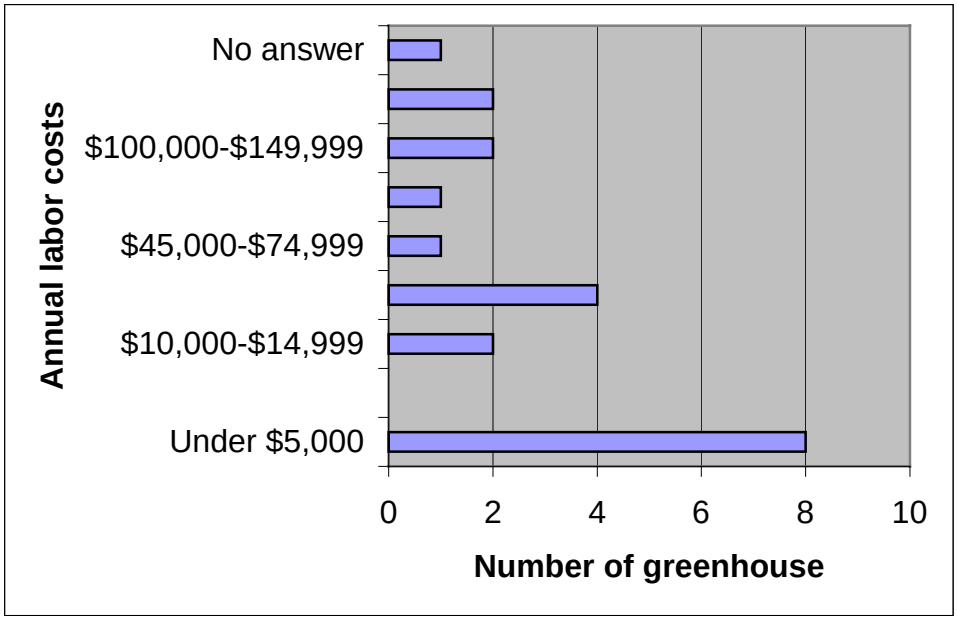


Figure 11. Average labor costs per square foot by greenhouse size in Monroe County.

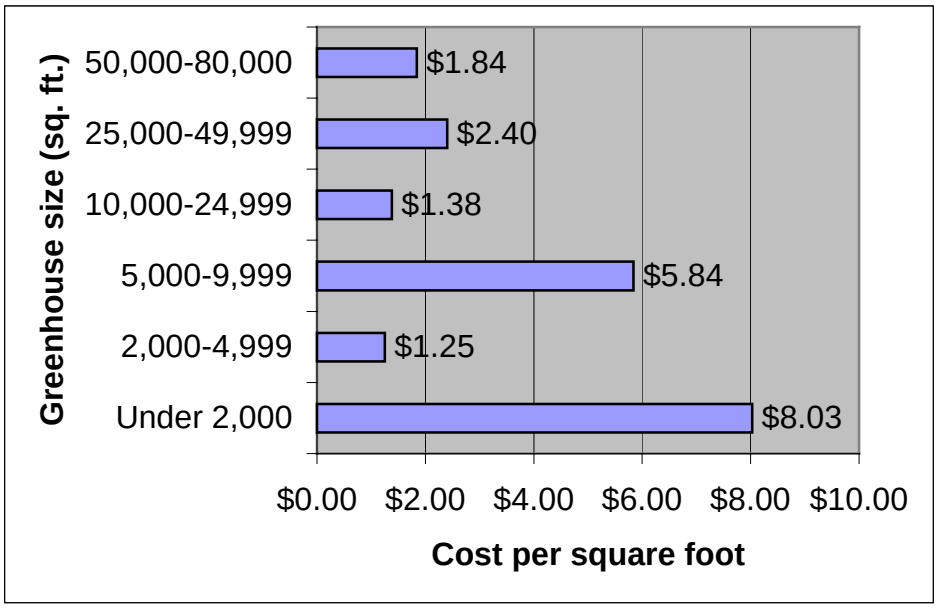


Figure 12. Average number of full-time, part-time, and seasonal employees (including family members) employed each month in Monroe County greenhouse firms.

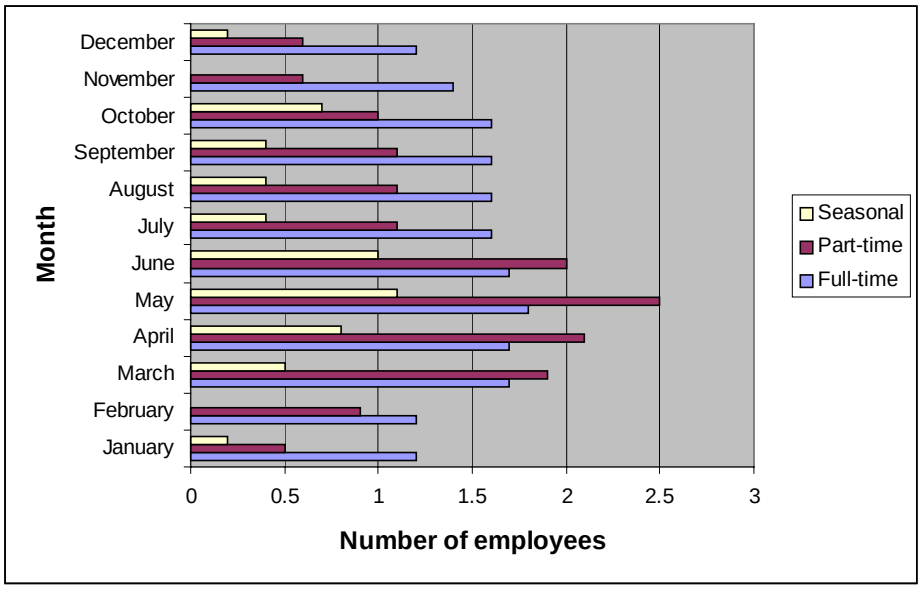
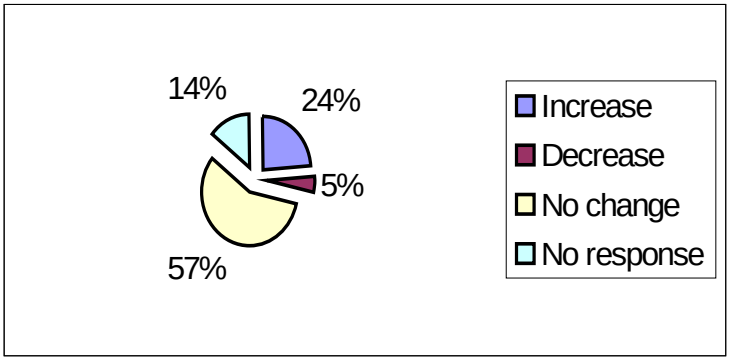


Figure 13. Number of Monroe County greenhouse firms indicating a change in employees since 1995.



APPENDIX A

Empirical Analysis of Monroe County Greenhouse Industry Productivity

Empirical Analysis of Greenhouse Industry Productivity

The logit model assumes that the probability of a grower attaining a high space productivity, $P_{i,}$ depends on a vector of independent variables (X_{ij}'s) associated with the grower i and variable j, and vector of parameters ß's. A dependent variable such as $y_i = 1$ if the productivity of the grower is above some predetermined value (in sales per square foot), and $y_i = 0$ otherwise. For the logit model, the probability of attaining high productivity (i.e., $y_i = 1$) is given by:

$$P_i = F(Z_i) = F(\alpha + \beta X_{ij}) + 1 / [1+exp\ (-Z_i)]$$

Where:

P_i = probability that a grower will have a high productivity or not, given the knowledge of various factors (X_{ij}'s);

$F(Z_i)$ = the value of the cumulative logistic function associated with each possible value of the underlying index Z_i;
Exp = base of natural logarithms; and
Z_i = underlying index number of βX_{ij}, is a linear function of the independent variables.

Thus:

$$Z_i = log\ [P_i/(1- P_i)] = \beta_0 + \beta_1 X_{11} + \beta_2 X_{12} + ... + \beta_n X_{1n} + \varepsilon$$

Where:

Z_i = the unobserved index level or the log odds of the choice for the ith observation

i = 1, 2,…, I denotes the individual growers;
j = 1, 2,…, n represents the independent variables;
X_{ij} = the jth explanatory variable for the ith individual;
β = the parameters to be estimated; and
ε = error term or disturbance term.

The dependent variable Z_i in the above equation is the logarithm of the probability that a particular choice will be made. In empirical analysis, the following models were used to predict the probability that a grower would attain high space productivity:

Model 1 with Herfindahl Index as a Measure of Specialization

$$Prodrate_i = \beta_0 + \beta_1 Age_i + \beta_2 Matsales_i + \beta_3 Sole_i + \beta_4 Hfindex_i + \beta_5 Retail_i + \beta_6 Income_i + \varepsilon.$$

Where:

$Prodrate_i$ = 1 if the grower sales per square foot of greenhouse was greater than $25 per square foot and 0 otherwise.

Age_i = Age of greenhouse firm i;
$Sole_i$ = 1 if the legal structure of greenhouse firm i is sole proprietorship and 0 otherwise;
$Matsales_i$ = Total costs of materials and supplies of the greenhouse firm i;
$Hfindex_i$ = The Herfindahl Index that takes a value between 0 and 1;
$Retail_i$ = 1 if the greenhouse firm i obtains at least 50% of its sales from retail operation and 0 otherwise;
$Income_i$ = 1 if the greenhouse firm i is the major source of income and 0 otherwise.

Model 2 with Entropy Index as a Measure of Diversification

$$Prodrate_i = \beta_0 + \beta_1 Age_i + \beta_2 Matsales_i + \beta_3 Sole_i + \beta_4 Entropy_i + \beta_5 Retail_i + \beta_6 Income_i + \varepsilon.$$

Where:

$Prodrate_i$ = 1 if the grower sales per square foot of greenhouse was greater than $25 per square foot and 0 otherwise.

Age_i = Age of greenhouse firm i;
$Sole_i$ = 1 if the legal structure of greenhouse firm i is sole proprietorship and 0 otherwise;
$Matsales_i$ = Total costs of materials and supplies of the greenhouse firm i;
$Entropy_i$ = The Entropy Index that takes a value between 0 and 1;
$Retail_i$ = 1 if the greenhouse firm i obtains at least 50% of its sales from retail operation and 0 otherwise;
$Income_i$ = 1 if the greenhouse firm i is the major source of income and 0 otherwise;

Firm Diversification Theory and Scale Measures

The Herfindahl Index and the Entropy Index are used as scale measures of diversification or specialization.

Define S_i as the total sales (greenhouse business activity) of crop i (bedding plants, perennials, hanging baskets, outdoor cut flowers, pot mums, poinsettias, geraniums, other potted plants, herbs, and other crops) and $\sum_i S_i$ as the greenhouse annual gross sales; and let $P_i = S_i / \sum_i S_i$ denote the share of crop i in the total sales of the greenhouse. Then the following measures of diversification are considered (Pope and Prescott, 1980):

The Herfindahl Index is:

$\sum_i$ *(crop i % of total business activity)*^{2} = $\sum_i P^2_i$.

The Herfindahl Index takes a value of 1 when there is complete specialization and approaches 0, as the number of crops (N) gets large. That is, if diversification is perfect, such that:

$S_i = 1/N)*S$ and $N \rightarrow \infty$, the $\sum_i P^2_i = 1/N \rightarrow 0$.

The Entropy Index is:

$-\sum_i$ *(crop i % of total business activity)* log (crop i % of total business activity)* = $-\sum_i P_i$ * *log* P_i.

The value of the Entropy Index for completely specialized firms, those with only one product line is 0. That is, if diversification is perfect, the Entropy Index approaches its maximum when $P_i = 1/N$. The index of maximum crop share in the total sales is: Max (crop i % of total business activity) = max P_i.

The results from the Herfindahl and Entropy Indexes are summarized in the table below:

Empirical Measures of Greenhouse Firm Diversification.

Greenhouse Firm	Firm Size	Herfindahl Index	Entropy Index	Max. Crop Share
1	300	1.00	0.00	1.00
2	1500	0.42	0.41	0.50
3	25000	0.25	0.20	0.45
4	10000	0.24	0.65	0.30
5	59000	0.35	0.62	0.55
6	43181	0.52	0.41	0.70
7	80000	0.73	0.22	0.85
8	288	1.00	0.00	1.00
9	2000	1.00	0.00	1.00
10	7500	0.37	0.45	0.50
11	30000	0.34	0.65	0.55
12	60000	0.32	0.61	0.50
13	65578	0.25	0.67	0.40
14	8000	0.24	0.73	0.40
15	2000	0.38	0.45	0.50
16	1500	0.68	0.22	0.80
17	28000	0.51	0.45	0.70
18	20000	0.19	0.73	0.25
19	8000	0.29	0.60	0.45
20	100	0.90	0.08	0.95

APPENDIX B

Monroe County Greenhouse Industry Survey

MONROE COUNTY GREENHOUSE INDUSTRY SURVEY

1) What year was your firm established?_____

2) What is the legal structure of your firm? a) sole proprietorship, b) partnership, c) C corporation, d) sub-chapter S corporation, e) other_____(Circle one).

3) Are you involved in other farming operations besides greenhouse production? ___yes, ____no.

4) If yes, please list them._____.

5) I would describe sales from my operation as ___% retail, ___% wholesale (Total=100%)

6) The approximate percentage of total sales for the following crops are

___%bedding plants	___ % perennials	___% hanging baskets	___% outdoor cut flowers
___% pot mums	___% poinsettias	___% geraniums	___% herbs
___% geraniums	___% other potted plants _____		___% other _____

7) Do you (check all that apply):

____produce your own plugs ____buy pre-finished plants
____buy in plugs ____sell pre-finished plants
____sell plugs

8) The total size of my production greenhouse(s) = _____sq. ft.

9) Since 1995, my greenhouses have a) stayed the same size, b) increased by_____sq. ft., or c) decreased by___ sq. ft. (circle letter and fill in the amount).

10) Do you anticipated expanding your operation within the next five years? Yes or no (Circle one; if no, skip to number 11).

If yes, will you be expanding in your a) retail operation, b) wholesale operation, c) production greenhouses, d) all three e) other_____(Circle all that apply).

11) Please indicate the number of full-time, part-time, and seasonal employees (including family members) you employ each month:

	Full-time	Part-time	Seasonal		Full-time	Part-time	Seasonal
Jan.	____	____	____	July	____	____	____
Feb.	____	____	____	Aug.	____	____	____
Mar.	____	____	____	Sept.	___	____	____
Apr.	____	____	____	Oct.	____	____	____
May	____	____	____	Nov.	____	____	____
June	____	____	____	Dec.	____	____	____

12) Since 1995, has the number of employees a) increased, b) decreased, or c) stayed the same?

13) What percentage of your firm's total annual sales occur during each month?

Jan. ____%	Apr. ____%	Jul. ____%	Oct. ____%
Feb.____%	May ____%	Aug. ____%	Nov. ____%
Mar. ____%	Jun. ____%	Sep. ____%	Dec. ____%

14) Is your greenhouse a ___ part-time business or ____ full-time business?

15) Is your greenhouse your major source of income? ___yes ___no

16) Do you sell greenhouse products a)in state, b) to neighboring states c) distant states (list)_____
d) out of country. (Circle all that apply)
If Yes, what percentage of total sales are to out of state customers? _____
If Yes, what percentage of total sales are to out of country customers?_____

17) If Retailer: Most of my competition comes from : (Circle appropriate response)

Large retail chains – Mass Merchandisers	Strongly agree	Agree	Disagree	Strongly Disagree
Retail firms – Garden Centers	Strongly agree	Agree	Disagree	Strongly Disagree
Retail firms – Supermarkets	Strongly agree	Agree	Disagree	Strongly Disagree
Other_____	Strongly agree	Agree	Disagree	Strongly Disagree

18) If Wholesaler: Most of my competition comes from: (Circle appropriate response)

Growers in NY	Strongly agree	Agree	Disagree	Strongly Disagree
Growers in other states	Strongly agree	Agree	Disagree	Strongly Disagree
Growers in Canada	Strongly agree	Agree	Disagree	Strongly Disagree
Other_____	Strongly agree	Agree	Disagree	Strongly Disagree

19) If wholesaler: What percentage of your wholesale sales are to :
____% Large retail chains – Mass Merchandisers
____% Retail firms – Garden Centers
____% Retail firms – Supermarkets
____% Other_____

20) Have you investigated the plans for expansion by your competition? ____yes, ____no

21) Do you plan to expand into a niche market? ____yes, ____no
If yes, what is the niche?_____
If yes, how long to you expect it to remain a niche market?_____

22) What is the greatest deterrent to expanding your operation?

23) What is the greatest deterrent for this industry expanding in Monroe County?

24) Do you think that major expansion of the greenhouse industry in Monroe County will affect you a) positively, b) negatively, or c) no effect?

25) Please rate each of the factors listed below according to how much they impact your business. Use a 1 to 5 scale with 1=very minor, 2=minor, 3=neutral, 4=important, 5=very important.

Factor	1	2	3	4	5
Ability to attract and retain competent management					
Ability to attract and retain competent hourly employees					
Own managerial expertise					
Market demand					
Capital					
Production costs					
Competition					
Zoning regulations					
Environmental regulations					
Other governmental regulations					
Weather uncertainty					
Other_____					

26) Please rate each of the factors listed below according to how much they impact your ability to **grow** healthy plants. Use a 1 to 5 scale with 1=very minor, 2=minor, 3=neutral, 4=important, 5=very important.

Factor	1	2	3	4	5
Controlling insects					
Controlling diseases					
Controlling weeds					
Water quality					
Weather					
Cultural requirements of new crops					
Scheduling crops in the greenhouse					
Incorporating new technologies for growth					
Other_____					

27) Regarding price determination, please rate the level of importance of each factor listed below. Use a 1 to 5 scale with 1=very minor, 2=minor, 3=neutral, 4=important, 5=very important.

Factor	1	2	3	4	5
Cost of production					
Inflation					
Other grower's prices					
Grade of plants					
Market demand					
Product uniqueness					
Inventory levels					
Last year's price					
Other_____					

28) Regarding factors that might limit the expansion of your business, please rate the level of importance of each factor listed below. Use a 1 to 5 scale with 1=very minor, 2=minor, 3=neutral, 4=important, 5=very important.

Factor	1	2	3	4	5
Capital					
Marketing					
Personnel					
Production					
Transportation					
Plant selection					

29) Please indicate your firm's labor costs last year.

____ Less than $5,000
____$5,000-$9,999
____$10,000-$14,999
____$15,000-$44,999
____ $45,000-$74,999
____ $75,000-$99,999
____ $100,000-$149,999
____$150,000-$224,999
____$225,000-$299,999
____$300,000-$599,999
____$600,000-$1,000,000
____Over $1,000,000

30) Please indicate your firm's materials and supplies costs last year.

____ Less than $5,000
____$5,000-$9,999
____$10,000-$14,999
____$15,000-$44,999
____ $45,000-$74,999
____ $75,000-$99,999
____ $100,000-$149,999
____$150,000-$224,999
____$225,000-$299,999
____$300,000-$599,999
____$600,000-$1,000,000
____Over $1,000,000

31) Please indicate the annual gross sales for your firm last year.

____ Less than $10,000
____$10,000-$24,999
____$25,000-$49,999
____$50,000-$149,999
____ $150,000-$249,999
____ $250,000-$349,999
____ $350,000-$449,999
____$450,000-$749,999
____$750,000-$999,999
____$1,00,000-$1,999,999
____$2,000,000-$3,500,000
____Over $3,500,000

Thank you for taking the time to provide information about your business.