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Regional Analysis of Trade Flows and Marketing Practice Trends in the United States Nursery Industry

Bryan Frank Combs
University of Tennessee, Knoxville

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To the Graduate Council:

I am submitting herewith a thesis written by Bryan Frank Combs entitled "Regional Analysis of Trade Flows and Marketing Practice Trends in the United States Nursery Industry." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Charles Hall, Major Professor

We have read this thesis and recommend its acceptance:

John Brooker, William Klingeman

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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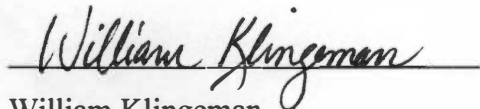


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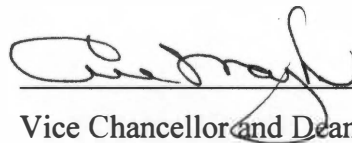


John Brooker



William Klingeman

Acceptance for the Council:



Vice Chancellor and Dean of
Graduate Studies

AG-VET-MED.

Thesis
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**Regional Analysis of Trade Flows and Marketing Practice Trends in
the United States Nursery Industry**

**A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville**

**Bryan Frank Combs
May 2006**

DEDICATION

This thesis is dedicated to my wife, Amanda Combs and my parents, Frank and Linda Combs. Amanda, thank you for your support and understanding over the last few years while I have continued my education. Mom and Dad you have always believed in me, encouraged me and supported me in my goals. I can not begin to thank you all enough for the encouragement and support you have given me.

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ABSTRACT

The rapidly growing nursery and greenhouse industry comprises an important part of the agricultural sector of the United States with sales growing at nearly 8.0 percent annually from 1966 to 2004. Aggregate information about the U.S. nursery industry is readily available, however little information is available on trade flows and marketing practices of the industry.

The goal of this study was to identify structural adjustments in the nursery industry as indicated by regional trade-flow trends, production practices, and marketing practices in the nursery and greenhouse industry from 1988 to 2003. This was accomplished through a comparison of responses to two national surveys of nursery and greenhouse operators. Except on a single-state basis, little attention has been given to the dynamic information available across surveys. To provide an initial description of important trade-flow trends in the industry, responses to the 1989 and 2004 surveys were examined by region allowing for comparisons over a 15-year span between 1988 & 2003.

To describe change in the industry between the 1989 and 2004 surveys, two methods were used to compare variable means. For questions with binary responses, a *t*-test was performed to determine significant differences in the two surveys. For questions with multiple responses, chi square tests of independence were performed.

Significant changes in the nursery industry have occurred in types of plants grown, plant packaging form sales, sales transaction methods, sales to wholesale/retail outlets, allocation of advertising dollars and computerization.

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SECTION 1. INTRODUCTION

The rapidly growing U.S. nursery and greenhouse industry comprises an important part of the agricultural sector of the United States. The 2002 Census of Agriculture reported there are approximately 64,000 firms in the nursery and greenhouse industry employing approximately 600,000 workers in peak seasons; 40,000 year around; and 105,000 seasonally (NASS 2002). Nursery crop sales have grown at an average annual rate of 8.0 percent from 1966 to 2004, changing from \$826 million in 1966 to \$15.7 billion in 2004 (ERS 2005). Growth rates have declined over the last three decades. For example, in the 1970s average annual growth was 13.6 percent whereas in the 1980s and 1990s average annual growth was 9.9 percent and 4.6 percent respectively (Figure 1-1). Greenhouse and nursery crops in 2003 were the fourth largest crop group based on farm cash receipts (Jerardo 2004).

The U.S. nursery and greenhouse industry has experienced rapid growth since the 1980s, though in the last few years showed signs of leveling off. This is due largely to the increase in imported products, mostly in ornamental crops including floriculture and nursery products. In 2005, sales from nursery products were estimated to be \$15.7 billion, about 1.3 percent above 2004 sales levels. Average household expenditure for nursery products also increased over the time period from \$143 to \$144 (Jerardo 2005).

Information on sales, acreage and the number of firms in the industry are shown in Table 1-1¹. The number of farms increased between 1987 and 1997. Although there was a decline in number of farms by 2002 versus 1997, the number of farms in 2002 was greater than the number in 1987. Acreage in production has shown a steady increase

¹ All tables are found in the appendix page 36.

from the 1987 to 2002 census along with sales, which have increased between the two census years. Individual states have experienced divergent patterns of growth. For example, California farm numbers increased by a factor of 1.4 between 1987 and 2002, whereas farms in Tennessee increased by a factor of 2.4 and farms in North Dakota experienced a decline (NASS 1992, 1997, and 2002).

Table 1-2 shows the percentage changes (1987 versus 2002) in the number of farms, square feet under protection, acres, and sales for each state. Kentucky showed the largest amount of growth in the number of farms at 183.8 percent, while North Dakota showed a 2.5 percent decline in the number of farms from 1987 to 2002. Square feet under protection in Nevada increased significantly from 1987 (1,219.4 %) while square feet under protection in Connecticut (42.3 %) decreased over the period. Although Nevada experienced a large amount of growth in square feet under protection, the number of open air production acres declined. Five other states declined in open air production as well (South Dakota, Rhode Island, New Hampshire, Indiana, and Connecticut) with acres of production in Connecticut decreasing by the largest amount (28.0 %). Open air production in Montana, however, showed an increase of 308.4 percent over the period. Sales for every state except Pennsylvania (decline of 72.4%) were higher in 2002. The largest increase at 723.6 percent was in North Carolina (NASS 1992 and 2002).

Very little is known about the changing trade flow structure of the nursery and greenhouse industry. This includes sources of inputs, acreage, geographic distribution of operations, employment and distributions of sales by type of outlet and geographic location. Given the increasingly competitive nature of the market and variations in

experience of the green industry across states, component assessments are needed to assist stakeholders in managerial decision making.

This study identifies structural adjustments in the nursery industry as indicated by regional trade-flow trends, production practices and marketing practices in the nursery and greenhouse industry from 1988 to 2003. This was accomplished through a comparison of responses to two national surveys of nursery and greenhouse operators conducted in 1989 and 2004 (see section 2). These surveys were chosen to permit the greatest amount of time to identify trends and also included the greatest number of states for comparison. Coverage of specific areas included: length of time in operation, number of employees, extent of computerization, distribution of sales (e.g., among plant groups, plant categories and type of sales outlet), factors affecting price determination, distribution of promotional dollars and value of sales. Trend analysis of the green industry was achieved by completing the following procedural steps:

1. Identifying comparable questions and response categories in the two surveys.
2. Using a computer program (SAS) that recoded the questionnaire responses for comparison.
3. Using appropriate statistical procedures to identify statistically significant differences in the patterns of responses to questions between the two surveys.
4. Interpreting results of statistical procedures and graphical analyses with respect to identification of important trends in the nursery and greenhouse industry.

SECTION 2. REVIEW OF LITERATURE

Aggregate information about the U.S. nursery industry is readily available. The USDA produces several publications, including the 2002 Census of Agriculture and the annual Floriculture and Nursery Crops Yearbook (NASS 2002 and Jerardo 2003). These spreadsheets and publications provide information about cash receipts and sales for the U.S. nursery industry, but provide little information on trade flows and marketing practices of the industry. This is due, in part, to two factors. First, the nursery industry has not been included data collection efforts by federal and state governments at the same magnitude as traditional agricultural crops, such as soybeans, cotton, corn, and tobacco. Second, the diversity and number of plant materials grown by nurseries exacerbates data collection efforts (Brooker and Turner 1990).

The S-103 Regional Research Committee has conducted four separate surveys to obtain information on trade flows and marketing practices at the national level. The first survey, conducted in 1989, aimed to identify trade flows and marketing practices within the U.S. nursery industry for 1988. Data regarding trade flows and marketing practices from operations in 23 states were gathered. There were a total of 1,504 respondents from 23 states. A second survey conducted in 1994 collected 1993 data from 1,316 respondents, and included 24 states that represented about 80 percent of the total United States production of landscape plant material. The third survey was conducted for 1998 and included 22 states with 1,756 total respondents, representing 69 percent of the U.S. grower cash receipts. The fourth and most recent survey (2004) was for 2003 data and

included 44 states with 2,485 total respondents representing 93 percent of grower cash receipts.

The inaugural 1989 national survey identified much needed information for the nursery industry. It showed that telephone and person-to-person transactions were by and large the most frequent exchange method. Sales showed spikes in spring and fall with a decline in the summer and limited winter sales (Brooker and Turner 1990). On average, 2.8 percent of sales were allocated to advertising. States with newer industries, e.g., those established after the mid 1970s, had higher advertising percentages. A larger portion of advertising dollars for the nursery industry was used on catalogs and trade shows. The majority of nurseries reported individual firm sales occurring at the wholesale level while three states (Arkansas, Delaware and Kentucky) reported large percentages of retail sales (Brooker and Turner 1990). In 1993, the majority of sales were at the wholesale level, while a few states (Connecticut, Massachusetts and Michigan) reported sales of 40 percent or more at the retail level. Trade shows and catalogs were again the dominant advertising outlets in the majority of states surveyed with an average of 4.3 percent of sales going toward advertising. There was also 85 percent of repeat business reported for the major producing states (California and Florida) (Brooker, Hinson, and Turner 1993).

Dominant advertising outlets in 1998 were catalogs and trade shows. An average of 5.1 percent of sales was spent on advertising. Sales to mass merchandisers showed a strong increase, while sales to garden centers declined from the 1993 survey. There were also declines in the amount of business done with repeat customers. High percentages of

large volume states (California, Florida and Texas) participating in contract production were seen as well (Brooker 2000).

Entry of new firms into the nursery industry increased according to the 2004 survey. Over half of the states reporting for the 2004 survey had increases in the number of new firms. Of the 44 states that reported, 31 had a five percent increase or higher in number of firms entering into the nursery industry since 2000. Entry of new firms into the market implies that the nursery industry continues to have benefits which are attractive for entry into the market (Brooker et al., 2005).

The entry of new firms into the nursery industry also has a positive effect on employment by the nursery industry. The majority of the 44 states surveyed indicated positive increases in the number of both temporary and permanent workers in the last five years (Brooker et al., 2005).

For the total U.S. nursery industry, deciduous trees had the largest percentage of sales by plant category at 13.6 percent, followed closely by flowering annuals at 10.4 percent. The 2004 survey also highlighted diversification in sales by plant category between the states (Brooker et al., 2005).

Nursery sales by root media displayed 63.4 percent of sales to the container-grown products. Balled-and-burlapped was the next closest root media form accounting for 16.3 percent of the sales (Brooker et al., 2005). Examination of sales by the transaction method revealed that of the 44 states surveyed the major transaction methods used were telephone orders and in-person orders accounting for 46.1 and 44.0 percent of sales, respectively (Brooker et al., 2005). Trade shows (25.6%) and catalogs (22.5%)

were the two dominate advertising methods. Retail sales accounted for 19.6 percent of sales, while wholesale accounted for 80.4 percent. The export market accounted for only a small portion of the total sales dollars at 1.8 percent. Hawaii was the major exporter at 28.6 percent of total sales of the nursery products (Brooker et al., 2005).

Over 60 percent of respondents in the states surveyed reported word processing as a use for computers in their firms. Cost of production and plant grades were the most important factors in setting prices for all nurseries surveyed. While market demand and weather uncertainty were the top factors impacting nursery business (Brooker et al., 2005).

Published analyses of each of the four regional committee surveys has focused on descriptions of trade flows associated with each survey. Except on a single-state basis, little attention has been given to the dynamic information available across surveys. Nevertheless, separate descriptive analyses do suggest important structural changes have occurred in the industry since the first survey in 1989. Two prominent changes between 1988 and 1993 were the growth of the industry and the change in percentage of sales from advertising increasing from 2.8 percent in 1989 to 4.3 percent in 1993. The 1993 and 1998 surveys captured several changes in the operation of the industry that were not as dominant in the earlier surveys. For example, participation in trade shows declined, but the share of sales at trade shows has shown little change. This implies that individual transactions at trade shows were larger. Sales to repeat customers also declined. There were 17 states that had nurseries that reported in both 1993 and 1998 surveys. Twelve showed declines in sales to repeat customers. The 1998 survey contained a relatively

large number of new entrants which could account for some of the decline versus the 1993 survey as they searched for new customers (Brooker, Hinson and Turner 2000).

The annual growth rate of about 5 percent in the U.S. green industry makes it a major part of the agricultural sector. While the sale of floriculture crops had declined due to a large amount of imports in cut flowers, nursery crops have sustained or in some areas shown growth because of lower levels of imports. Another major benefit to the nursery industry was per-household sales of about \$139 over the last few years (Hall, Hodges and Haydu 2005). In recent years consumers have seen new varieties of products, while at the same time retailers are placing more demands on the growers to gain higher market share in retail nursery products. Consumers are also seeing divisions in traditional retailers and mass marketers. Mass marketers are starting to stock products such as cut flowers along with a selection of potted flowering plants, and seasonal bedding/garden plants (Hall, Hodges and Haydu 2005).

Producers are also incurring added challenges from mass marketers. Several mass marketers are requiring plants of a specific size so that they can be easily displayed in their establishments. These types of requirements place added strain on the profitability of growers because they often have to sell unconforming products at a reduced price. The consideration of buyers to begin using a pay-by-scan method could possibly have a great effect on producers. This method would require that the producers absorb the cost of unsold plants which retailers currently incur (Hall, Hodges and Haydu 2005).

Increased mass market need for nursery products has led to development of larger producers. In some cases firms partnered with other firms to meet the demand of the mass marketers. Although larger growers focused on mass market sales, small growers remained competitive by either participating in the retail sector themselves or selling to other independent retailers (Hall, Hodges and Haydu 2005).

Studies on economic impacts of the U.S. green industry show national output of the industry to be \$147.8 billion, accounting for 1,964,339 jobs and value-added dollars at \$95.1 billion (Hall, Hodges and Haydu 2005). Subdivided into four regions, the East had the highest employment impact at 540,496 jobs which was followed closely by the South at just under 500,000 jobs (Table 2-1). The West had the largest impact on output at \$37.3 billion. The East accounted for \$27.0 billion in value added dollars followed by the West at \$24.8 billion (Hall, Hodges and Haydu 2005). These output, employment and value added dollar impacts emphasize the importance of understanding trade flow and marketing practices in the nursery industry.

Sales transaction methods for the nursery industry are important because they deliver price messages to both producers and marketers. The nursery industry has tended to rely more on market-defined grades (size and quality standards), which increases the contact between the buyer and seller. Buyers make their buying decision based on the approval of the plant quality or relationships from past experience with the seller (Hinson, Turner and Brooker 1995). In the future search and transactions costs may be somewhat reduced by the recent introduction of industry standards as described in the American Standard for Nursery Stock (ANLA 2004).

When examined by effects of age, gross sales, market channels and region on the choice of transaction methods, age of the firm showed that a higher proportion of sales by older firms were made using telephone and mail order. Younger firms relied more on in-person sales (Hinson, Turner and Brooker 1995). Firms with fewer sales tended to have a larger amount of telephone orders and firms higher in sales had larger amounts of orders through trade shows and in-person methods. Transaction methods varied depending on market channel. For example, sales to re-wholesalers were more likely to occur at trade shows that provide an opportunity to sell a large amount of products to a buyer. Retail sales primarily made by small producers were from customers attracted to the firm by other nearby retail stores (Hinson, Turner and Brooker 1995).

Differences were also apparent regionally. The Western region had lower proportion of sales through trade shows. In part this could be related to distance between Western producers and the large market segments of the Eastern and Midwestern U.S. Southeastern U.S. states had fewer in-person and mail orders with larger amounts of telephone orders (Hinson, Turner and Brooker 1995).

Since the early 1980s, the U.S. nursery industry experienced major structural changes. A study on economic contribution of the green industry in Arizona showed nurseries losing retail market share to mass merchandisers and discount chains (Leones and Ralph 1995). Household expenditures of nursery products revealed age, income and education as factors affecting plant purchases (Gineo and Omano 1990). Other studies have related the correlation between construction of both residential and commercial properties with increase in sales of nursery products (Johnson and Johnson 1993).

Several studies in the 1980s and 1990s evaluated priorities of customers' decisions regarding where to purchase nursery products. These studies identified most important criteria for a purchase outlet as plant quality and selection (Swanson 1984; Khatamian and Stevens 1994; Powel 1994). This has demonstrated some change in the consumer's priorities for purchasing locations from an earlier study where selection, location and price were the major factors (Padgett, Mull and Frazier 1965).

Entry into the green industry is encouraging for new firms due to the amount of growth in the industry over the past few decades. Firms currently in the retail market side of the industry do have some concerns as many consumers are moving away from purchasing everyday nursery products from traditional garden centers to mass merchandisers. However, consumers are still largely dependent on garden centers for major purchases and when they desire information about nursery products (Barton, Brooker, Hall and Turner 1998).

SECTION 3. METHODOLOGY

To provide an initial description of important trade-flow trends in the industry, responses to the 1989 and 2004 surveys were compared. Although surveys were performed in 1989 and 2004, the data gathered were for the preceding years, 1988 and 2003 respectively. These particular studies allowed comparisons to be made over a 15-year time span between 1988 and 2003. Of 23 states included in the 1989 survey and 44 states included in the 2004 survey, there were 21 states that were involved in both surveys (Table 3-1).

Questions for both surveys were developed by members of the S-103 (subsequently renumbered S-290) Regional Research Committee. The 1989 survey was distributed by mail and each state varied in the selection process for nurseries in that state. Some states contacted all licensed nurseries while others variously limited the number of nurseries to minimum acreage requirements, a random sample of all nurseries, or a percentage of total production.

Sampling for the 2004 survey was done by grouping nurseries as small (less than 5 acres), medium (5 to 20 acres), or large (20 or more acres) based on acreage from each of the 44 states. Target sample size for the 2004 survey was 15,000 nurseries of which 100 percent of large nurseries, 60 percent of the medium nurseries, and 25 percent of the small nurseries were selected to be surveyed.

Some questions in each of the three subsequent surveys were modified since the 1989 survey to improve accuracy and capture changes in industry terminology. Due to

these modifications (Table 3-2), some questions and/or response categories are unique to a particular survey and cannot be used in time-series comparisons.

Comparisons of regional averages by survey were made for nurseries that have operations in another state, the number of years in operation, the number of employees including both permanent and temporary and the use of computers for functions such as word processing, accounting, inventory, financial investments, marketing and communications. This will provide general information about changes that have taken place with respect to where the nurseries operate, maturity of the firms, employment, sources of inputs and changes in the use of technology.

Several sales comparisons were made. Percentage of sales were compared for deciduous shade/flowering trees, deciduous shrubs, broad-leaved evergreen shrubs, narrow-leaved evergreen shrubs, evergreen trees, vines and ground covers, roses, herbaceous perennials, tree fruits and propagated material. Plants sold by outlet type were examined, as were percentages in bare root, balled and potted, balled and burlapped, processed balled, container and field grown bag.

Sales were compared depending upon the number of trade shows attended in the year prior to the survey, percentage of sales done with repeat customers and percentage of sales transactions made using trade show orders, telephone orders, in-person orders and mail orders. Percentages of sales made at the retail and wholesale levels were also compared. Wholesale sales were further subdivided into percentages of sales transactions with mass merchandisers, landscape firms and re-wholesalers.

Trade flows of nursery products were evaluated for exports and percentage of sales from exports. Factors affecting decisions to expand, such as weather uncertainty,

land, market demand, labor, water supply, capital, own managerial expertise, competition, environmental regulations and the ability to hire competent management were compared.

Comparisons of determinants of pricing, including ranked level of importance of cost of production, inflation, other growers' prices, grade of plants, market demand, inventory levels and last year's price were made. Percentage of total sales the firms spent on advertising in the previous year were compared. Distributions of advertisements in yellow pages, radio/TV, catalogs, trade journals, newsletters and trade shows were also examined.

To describe change in the industry between the 1989 and 2004 surveys, one of two methods was used to compare the means. The method used depended upon the type of response given to the question. For questions with binary responses, a *t*-test was performed to determine significant differences in the two surveys. For questions with multiple responses, chi square tests of independence were performed.

The null hypothesis for the use of the *t*-test is that the mean of the question in the 1989 survey is equal to that of the 2004 survey. The alternative to the null hypothesis is that means in the two surveys are not equal. To perform the *t*-test a *t*-computed value (T_c) will be calculated using the formula below where $\overline{X}_{i,1}$ and $\overline{X}_{i,2}$ are sample means for 1988 and 2003 respectfully with *i* representing geographic grouping, and $S_{i,p}^2$ is the combined sample variances of the 1988 and 2003 data; assuming samples are statistically independent.

$$T_c = \frac{\overline{X}_{i,1} - \overline{X}_{i,2}}{\sqrt{S_{i,p}^2 / n_{i,1} + n_{i,2}}} \quad S_{i,p}^2 = \frac{\sum_{i=1}^{n_1} (x_{i,1} - \overline{x}_1)^2 + \sum_{i=1}^{n_2} (x_{i,2} - \overline{X}_2)^2}{(n_1 - 1)(n_2 - 1)}$$

The chi-square tests of independence and *t*-tests were performed by grouping the states into regions for comparison. The null hypothesis for these tests is that response patterns do not vary systematically by group by survey. The alternative hypothesis is that the response patterns vary systematically. The chi-square computed value is shown below, where, f_o represents the observed frequency and f_e represents the expected frequency. For both the *t*-test and the chi-square tests of independence significant computed values is justification for rejection of the null hypotheses and acceptance of the alternatives.

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

Geographic patterns in data were compared by arranging states into three regions (Table 3-3). Each state was placed in one of the three regions and comparisons were made using the chi-square tests of independence.

SECTION 4. RESULTS

Data from the two surveys were evaluated using two techniques based on the type of response to individual questions. Questions with numeric responses were evaluated using a *t*-test and questions with categorical responses were compared using the chi-square tests of independence. Significance at both the 0.05 and 0.01 level are shown in the results tables. A significant *t*-value or chi-square value leads to the rejection of the null hypothesis and acceptance of the alternative. It is also important to note that differences in the question response categories between the surveys did not allow for the comparison of all response categories. This resulted in percentages of some of the questions not totaling to 100 percent.

Section 4.1. Results of the t-Tests.

Mean percentages of sales in various plant categories in the northern region declined in all categories with the exception of herbaceous perennials and Christmas trees (Table 4-1). Christmas trees demonstrated an increase from 1.9 percent in 1988 to 13.3 percent in 2003 while herbaceous perennials increased from 4.6 percent to 11.1 percent over the time period. The mean percentage of sales for both Christmas trees and herbaceous perennials are statistically significant at the 0.01 level. The northern region also had significant mean differences in narrow-leaved evergreen shrubs and evergreen trees. Both showed declines over the period accounting for 12.3 percent in 1988 to 3.4 percent in 2004 for narrow-leaved evergreen shrubs and 28.5 percent in 1988 to 14.9 percent in 2004 for evergreen trees.

The southern region also declined in all categories with the exception of roses, herbaceous perennials and Christmas trees. Unlike the northern region the southern region had a smaller percentage change in the herbaceous perennials and Christmas tree categories. However, the mean percentage of sales to these categories was still statistically significant at the 0.01 level. The major declines in sales were demonstrated in the deciduous shade/flowering trees and the broad-leaved evergreen categories. Deciduous shade/flowering trees decreased from 21.9 percent in 1988 to 13.6 percent in 2003 and the broad-leaved evergreens declined from 22.3 percent in 1988 to 12.2 percent in 2003.

The western region declined for all categories except deciduous shrubs and herbaceous perennials. Sales of herbaceous perennials increased from 7.1 percent in 1988 to 10.0 percent in 2003. This increase in the mean sales from herbaceous perennials was significantly different between the two surveys at the 0.01 level. The major decreases for the region are shown in the Christmas tree and broad-leaved evergreen shrub categories. Christmas trees moved from 11.8 percent in 1988 to 1.2 percent in 2003 while broad-leaved evergreen shrubs moved from 16.3 percent in 1988 to 7.9 percent in 2003.

Northern region mean percentage of sales in the balled and burlapped stock declined from 46.2 percent in 1988 to 32.8 percent in 2003 (Table 4-2). While the balled and burlapped stock sales declined for the region the mean percentage of sales of plants in containers increased from 28.1 percent in 1988 to 42.9 percent in 2003 for the region. The southern showed a similar pattern in sales of balled and burlapped and container forms. The balled and burlapped declined from 30.3 percent in 1988 to 14.8 percent in

2003 and the container form increased from 53.1 percent in 1988 to 62.5 percent in 2003. There were statistically significant differences in the mean sales for the balled and burlapped and container forms for both the northern and southern regions at the 0.01 level.

The western region declined in the mean percentage of sales in the container form moving from 68.2 percent in 1988 to 61.6 percent in 2003. Another major change for the western region occurred in the balled and potted form of sales, increasing from 2.0 percent in 1988 to 5.4 percent in 2003.

The mean number of trade shows attended has had significant declines for all three regions (Table 4-3). All *t*-tests for the mean number of firms represented at trade shows were statistically significant at the 0.01 level. The mean percentage of sales transactions with repeat customers has declined slightly for the northern and southern regions but no statistical differences are shown. The western region, however, declined from 78.7 percent in 1988 to 71.2 percent in 2003 displaying statistical differences in the mean percentage of sales transactions with repeat customers at the 0.01 level for the region (Table 4-4).

The mean percentage of sales transaction methods had one major change for both the northern and southern region. The mean percentage of sales transactions from trade show orders has significantly declined for both regions. In 1988, 4.64 percent and 6.81 percent of sales transactions were credited to trade show orders. In 2003, only 1.93 percent and 3.2 percent of sales transactions were credited to trade show orders for the northern and southern regions respectively (Table 4-5).

The mean percentage of total wholesale sales has declined from 65.5 percent in 1988 to 47.4 percent in 2003 for the northern region (Table 4-6). The southern region declined from 79.7 percent in 1988 to 72.7 percent in 2003 and the western region had the largest decline moving from 85.2 percent in 1988 to 64.2 percent in 2003. While the mean percentage of wholesale sales has declined the mean percentage to retail has increased between 1988 and 2003 for all regions.

The northern region had significant declines in the mean percentage of sales to mass merchandisers, landscape firms, and re-wholesalers in the wholesale categories (Table 4-7). The major decline occurred for the mean percentage of sales to landscape firms. The southern region followed the same pattern as the northern region with decreases in all categories. The mean percentage of sales to mass merchandisers declined from 31.3 percent in 1988 to 22.4 percent in 2003. The western region also had significant decreases in the mean percentage of sales to mass merchandisers moving from 39.6 percent in 1988 to 28.8 percent in 2003. The mean percentage of total sales from exports declined for the northern region. The mean percentage of sales from exports moved from 0.5 percent in 1988 to 0.2 percent in 2003 (Table 4-8).

The mean percentage of total sales spent on advertising for the northern region was statistically different between 1988 and 2003 moving from 2.1 percent in 1988 to 3.8 percent in 2003 (Table 4-9). Major changes in the northern region also occurred in advertising dollars allocated to yellow pages, radio/TV, and catalogs. The mean difference in the allocation of sales dollars in these categories are all statistical significant at the 0.01 level.

The southern region also had significant increases in the percentage of total sales spent on advertising. A mean of 2.4 percent of sales was used for advertising in 1988 increasing to 3.9 percent in 2003. Like the northern region, the southern region also had significant increases for the allocation of sales dollars for radio/TV and catalogs. Significant increases were also shown for the allocation of sales dollars to trade shows increasing from \$6,076² in 1988 to \$24,567 in 2003. The mean percentage of sales spent on advertising increased from 1.8 percent in 1988 to 3.8 percent in 2003 for the western region.

Along with the other two regions the western region also displayed significant mean differences in the dollar amount allocated to radio/TV advertisement. Another major change in the mean dollar amount spent on advertising occurred for trade shows. Mean dollars spent on trade show advertisement moved from \$4,675² in 1988 to \$8,746 in 2003.

The mean value of nursery product sales has increased for all three regions (Table 4-10). The northern region had the lowest mean dollar change between 1988 and 2003 moving from \$827,703 in 1988 to \$1,081,286 in 2003. This was an increase of \$253,583 over the time period. The southern region increased by \$673,503 over the period and displayed the largest increase of sales from nursery products of the regions.

The northern region demonstrated significant proportional differences at the 0.05 level for the proportion of businesses with an operation in another state. The percentage changed from about 3.4 in 1988 to about 1.4 percent in 2003 (Table 4-11). Along with significant changes in the proportion of firms operating in another state, significant

² Values expressed in 2003 dollars (GDP Implicit Price Deflator, U.S. Dept. Commerce)

proportional differences occurred in the northern region for the number of firms exporting nursery products. The northern region decreased from about 8.0 percent in 1988 to around 4.0 percent in 2003 (Table 4-12). The western region also had significant proportional differences in the number of firms exporting nursery products over the period moving from 29.0 percent in 1988 to 19.0 percent in 2003.

Section 4.2. Results of the Chi-Square Tests.

The null hypotheses of the independence of the responses by survey by region were rejected at the 5 percent level of significance. With respect to the functions of the firm that are computerized, Table 4-13, significant proportional changes are shown for the use of word processing in the northern, southern and western regions between 1988 and 2003. The use of word processing was examined for either currently in use, planned to be used, or neither planned or in use. The northern region had 20 (4.8%) respondents currently using computers for word processing in 1988 and has moved to 481 (60.4%) respondents in 2003. There were also reductions in both the planned and neither categories. The southern and western regions demonstrated similar results with decreases occurring for the planned and neither categories. The currently in use categories increased between 1988 and 2003 for the southern and western regions, 127 (20.0%) to 560 (62.6%) and 88 (43.7%) to 198 (71.7%) respectively.

The use of computers for accounting functions demonstrated similar results for the northern, southern, and western regions with increases in currently in use and decreases in planned and neither planned or in use. The western region had the largest percentage (67.4) of respondents currently utilizing computer for the purpose of

accounting. The northern and southern regions had similar proportions. The use of computers for inventory purposes demonstrated increases in currently in use and the neither planned or in use categories between 1988 and 2003 for the northern and western regions. The southern region increased in the currently in use and decreased in the planned and neither planned/in use categories.

Using computers for financial analyses/investments also increased for the northern, southern, and western regions between 1988 and 2003. The western region had the greatest proportion currently in use at 29.0 percent followed by the northern and southern regions at 25.1 percent and 23.0 percent respectfully. The use of computers for internet commerce increased for the northern, southern, and western regions between 1988 and 2003. The northern region had the lowest percentage use of internet commerce at 24.2 followed by the southern at 28.3 percent and the western at 33.0 percent. All computerized functions examined were statistical significant at the 5 percent level between 1988 and 2003 implying that the response patterns vary systematically by survey year.

The northern and southern regions had similar changes between 1988 and 2003 for the years in operation. Both displayed declines in the firms in operation for less than 15 years and increases in the number of firms operating between 15 to 30 years. Fewer firms in existence for more than 30 years were reported in the northern region while greater amounts were reported for the southern region. The western region reacted similar to the northern with the exception of the less than 5 years in operation response increased slightly; however, the western region was not statistically significant over the time period (Table 4-14).

Permanent workers showed similar trends for the northern, southern, and western regions (Table 4-15). There were increases in the number of firms with less than ten permanent employees and decreases in the number of firms with more than ten permanent employees. The southern and the western regions had similar percentages of firms with less than ten permanent employees at about 39 percent for 2003. The northern region had the largest percentage at 44.5 percent for 2003. Temporary employment with firms with less than ten employees increased slightly for the northern and southern regions from 1988 to 2003. The western region decreased slightly over the period while the number of firms with more than ten temporary employees increased for the region. The northern and southern regions declined slightly from 1988 to 2003 for the number of firms with greater than ten temporary employees. The chi-square test for the northern and western regions was significant which implies that the proportions for the two regions varied significantly by survey year.

The proportion of small nursery operations has increased for the northern, southern, and western regions from 1988 to 2003, while the proportion of large firms has declined. The northern region has moved from 45.8 percent in 1988 to 62.2 percent in 2003. This was the largest change over the time period for any of the regions and was the only region with a statistically significant difference in the proportions between 1988 and 2003 (Table 4-16). It is important to note that the small category was classified as operations with sales at the \$125,000 gross value of sales for 2003 and at operations with sales at the \$300,000 gross value of sales for 1988. The dollar values shown are midpoint values of \$100,000 to \$499,999 for 1988 and \$0 to \$249,999 for 2003. The method of selection for the categories was chosen to provide a balance between the small and large

categories. The sampling procedure for the 1989 survey was focused mainly on gathering data from the large growers in the nursery industry while the 2004 survey had more information available which allowed for a more diversified sample of the firms.

Section 4.3. Non-statistical Comparisons.

Two questions between the two surveys could not be compared statistically due to differences in the rating scale used. Factors impacting nursery business and factors regarding price were rated on a likert-type 1 to 5 scale for the 1989 survey and 1 to 4 on the 2004 survey. Not important was rated as “1” while very important was rated as “4” or “5” respectively. General comparisons of these questions were examined by looking at the response rate of the “4” and “5” rating for the 1989 survey and the “3” and “4” for the 2004 survey. This allowed for percentages of the total response to be compared between the two surveys.

In 1988, the major factors impacting nursery business were market demand for the northern and western regions while the southern region’s major factor was labor. In 2003 the major factor impacting nursery business for all regions was market demand. Market demand accounted for around 20 percent of responses in 1988 and above 80 percent in 2003. Weather uncertainty also showed a large change between the two surveys. In 1988 weather uncertainty only accounted for about 12.0 to 18.0 percent of factors impacting business while in 2003 it accounted for about 60.0 to 74.0 percent of factors impacting nursery business.

The northern region showed a decline in the importance placed on management expertise and increased in importance for weather uncertainty. The southern region, on

the other hand, had declines in the importance placed on competition while it increased in the amount of importance placed on labor and management expertise. The western region had declines in the importance placed on labor and water supply and increased for importance placed on weather uncertainty and management expertise (Table 4-17). Factors affecting price determination for the regions' rated grade of plants, cost of production and market demand as the most important factors in determining price were also assessed (Table 4-18). The northern region rated grade of plants (80.8%) higher than cost of production (79.7%) but there was very little difference between the percentages of the two (Table 4-18). The northern region has had a great deal of change in the rate of price determinants between 1988 and 2003. In 1988, the most important factors in determining price were last year's price, inventory, and other growers' prices; none of which were in the top three ratings for 2003. The southern region followed similar trends to the northern region with the exception of market demand, which was rated as the second most important factor of determining price in 1988 and the third most important in 2003. The western region also rated market demand as the second most important factor in determining price in 1988 and was the third most important in 2003.

SECTION 5. SUMMARY AND CONCLUSIONS

There has been a great deal of change in the nursery industry between 1988 and 2003. Significant changes have occurred in the types of plants grown, plant form sales, sales transaction methods, sales to wholesale and retail outlets, allocation of advertising dollars and computerization. These changes indicate trends which are evident in the industry and are important to understanding trade flows and marketing practices.

All three regions increased in herbaceous perennials. This is not surprising since about 50 percent of total floriculture receipts are from bedding and garden plants, up from nearly 44 percent in 2000. Growth in sales is expected to increase for 2005 especially in the western states. This also correlates with a change in the market because the South and the West are narrowing the gap between the large markets in the Midwest and Northeast (Jerardo 2005). Another important reason for the increase in the bedding and gardening plants comes from the additional number of consumers that come into contact with nursery products as they are made more available by mass merchants (Hall, Hodges and Haydu 2005).

Mass merchandisers have had a large effect on the sales forms of nursery products. Demands by mass merchandisers have created a significant change in container sales for all regions except for the western. Decline in the mean percentage of container growth for the western region contradicts other secondary data that indicates container growth for Oregon has increased from about 42.3 million in 1999 to 53.4 million in 2003 (Oregon 2004).

Trade show participation has declined over the period for all regions. There is some anecdotal evidence suggesting that growers have used other advertising methods due to a change in the nature and structure of trade shows. Trade shows were originally focused on sales, but in the last few years have shifted focus to public relations and enhancing relationships with customers. Since trade shows are not a primary focus for sales, some of the growers have decreased the number in which they attend and are allocating the money to other advertising outlets. This is also shown in the percentage of sales transaction methods. The percentage of sales at trade shows has declined over the period, while in-person and telephone orders are major sales transaction methods.

Sales transactions with repeat customers have declined for all regions over the period but still remains an important part of nursery business accounting for about 70.0 percent of sales transactions. The decline in the amount of business with repeat customers is impacted by several market factors including: (1) the increase in the number of buyers in the entire market and (2) the increase in per capita consumption of nursery products, both of which are affected by growth in the housing market.

Recent evidence has shown a division in growers for the nursery industry. This bipolarization is demonstrated in the results of this study with the percent of wholesale transactions declining and the percentage of retail increasing. Larger firms are beginning to contract with mass merchandisers and are growing fewer plant varieties while the smaller firms are remaining competitive by competing for retail business in differentiated niche markets (Hall, Hodges and Haydu 2005). This allows the smaller retail firms to achieve economies of size and scale. These firms are also showing signs of vertical coordination such as purchasing cooperatives (Hughes and Hinson 2000). Examination

of wholesalers' sales to mass merchandisers, landscape firms, and re-wholesalers has declined over the period which correlates with the decline in wholesale transactions.

Respondents reported that sales from exports have declined for all regions, along with the percentage of firms exporting nursery products for all regions. However this does not follow precisely what is actually taking place in the industry. The dollar value of exports for the nursery industry is somewhat sporadic increasing from 1995 to 1998 then declining from 1999 to 2002 and increasing again for 2003 and 2004 (ERS 2005). With exports down for the few years prior to the 2004, survey growers surveyed may not have experienced the growth that was taking place in the export market. Also, with a lower percentage of firms exporting in 2003, it is expected that sales from exports would also decrease.

Recent growth in the nursery industry and more fierce competition has led to a greater focus on advertising. Catalogs and trade shows are major marketing channels in the nursery industry. Catalogs are one of the most important marketing tools that growers possess. Catalogs not only identify products that nurseries produce but also aid customers in making buying decisions and identify specializations of the firm (Helms, Laurent and McCoy 1996).

The gross value of nursery products has increased for all regions. There was a large amount of growth in the industry over the last decade but the amount of growth has slowed over the last few years. There was about 1.3 percent growth in 2004 and about 2.0 percent in 2005 compared to an average annual rate of 7.4 percent from 1960 to 2003. Higher energy and fuel prices have contributed to lower growth rates in the nursery

industry by reducing the amount of consumer spending on discretionary goods (Jerardo 2005).

The northern region has a significantly lower proportion of firms operating in another state from 1988 to 2003. There is little information available on firms that operate in multiple states. Geography could play a role in the lower proportion for the northern region. Since the northern states are small in size compared to other regions of the U.S., they are able to more easily access customers from states other than their own without a great deal of difficulty. Also, there could be a lower amount of consolidation in this region compared with other regions, although no empirical evidence exists to document this.

Computer usage has increased for all regions evaluated over the 15 year period. In 1988 nearly 44 percent of firms reported using computers for some function in their operation moving to about 78 percent in 2003. Word processing was the major use of computers accounting for about 60 to 70 percent of computer usage for all regions.

Computers assist nursery businesses in managing large amounts of complex information and making daily operations run more efficiently (Hall, Brooker and Eastwood 2004).

In 1988 there were a large percentage of firms operating between 0 to 15 years which fits into the time frame of the 1980s when the nursery industry was experiencing the largest annual growth rates. In 2003 there were a large percentage of firms operating between 15 to 30 years which would imply that a large percentage of the young firms in 1988 have remained in the industry and are shown as the older firms in 2003. However, the industry still shows a strong percentage (about 10 to 17 percent) of firms in operation

between 0 to 10 years for 2003. This implies that the nursery industry is attractive to new firms, despite the increasing competitiveness in the industry.

There has been a growth in the number of small firms in the industry since 1988. The northern region has the largest percentage of small firms with about 62 percent of the operations classified as small followed by the western region (55%) and southern region (49%). Effects of the growth in the percentage of small firms have had a significant effect on the northern and western regions' employment. The number of firms with ten or fewer employees (both permanent and temporary) has increased or remained close to the level of 1988 for all regions over the period.

Market demand and weather uncertainty were important factors affecting nursery business in both 1988 and 2003. Market demand is an important factor in any industry and it is not surprising that weather uncertainty was also an important factor. Abnormal weather patterns can have large effects on the production of firms in the nursery industry and it also has an affect on the demand for nursery products especially at the retail level. There is a correlation between weather and retail sales. A study by McCluer showed that as weather patterns changed so did sales at the retail level. The effect was not on normal variations in seasonal weather but rather exaggerations from the normal seasonal weather such as a warm January. Warm sunny weather had a positive affect on retail sales whereas cold rainy weather had a negative effect on retail sales (McCluer 2000).

Cost of production and grade of plants were the most important factors affecting price determination for 2004. Specifications for nursery products are mainly based on size, plant-to-pot ratios and appearance but have some variation depending on the growing region (ANLA 2004). Producers are also seeing increasing "quality-related"

demands from buyers, particularly mass marketers, requiring growers to meet specifications that are not standard in the industry so that the products can be easily displayed in their store more efficiently (Hall, Hodges and Haydu 2005).

Cost of production is also very important in setting prices. Firms must maintain detailed records for all costs that they incur in the production of their products. This would include factors such as growing costs, distribution costs and marketing costs. The combination of all of these costs sets a price floor for growers. The price floor acts as the minimum price and provides a break-even point for growers. On the other hand consumers set a price ceiling (willingness-to-pay) serving as the highest price a grower can charge for a product (AG Strategies 1999). Since demand for nursery products often influenced by factors external to the firm, it is very important that growers examine costs of production when setting prices.

The nursery and greenhouse industry is one of the fastest growing segments of U.S. agriculture. Although the recent growth in the industry has slowed over the last few years the industry is still attractive to new firms. This growth also brings about the need for further research into the industry. For future studies in the nursery industry, an evaluation of information based on the size of firms would be recommended. Evaluating data for the size of firms would indicate divisions in the market between the larger firms, which are dealing more with home centers and mass merchants, and the smaller firms, which are participating more in the retail garden centers and landscaping sectors.

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APPENDIX

Table 1-1. Number of farms, square feet under protection, open air acres and sales. For 1987 and 1992.

State	1987			1992			Sales (\$1,000)
	Farms	Sq. ft. under protection	Acres in the open	Farms	Sq. ft. under protection	Acres in the open	
AL	546	10,311,592	13,047	703	19,181,142	17,799	130,774
AK	75	943,236	74	79	855,676	108	6,639
AZ	211	2,414,777	5,115	270	5,851,123	7,080	65,361
AR	230	2,266,515	2,539	339	3,053,120	3,415	20,749
CA	3,382	164,248,948	63,702	3,845	166,728,597	72,272	1,661,762
CO	402	13,274,311	9,021	473	15,023,465	10,254	119,699
CT	484	19,131,108	8,704	638	10,767,618	7,319	126,581
DE	96	1,310,210	951	117	2,645,748	1,533	21,332
FL	4,373	149,344,657	85,801	5,180	180,123,683	100,248	1,024,315
GA	646	7,784,680	12,614	999	10,691,557	16,087	138,874
HI	1,139	25,435,239	2,264	1,580	25,227,763	3,409	81,495
ID	469	1,470,404	19,659	537	1,486,536	18,356	31,679
IL	805	14,019,397	24,266	1,036	16,134,768	30,655	221,264
IN	647	10,533,995	7,650	824	11,413,450	9,114	96,016
IA	357	4,518,800	5,007	518	5,855,432	5,749	57,854
KS	272	3,489,306	4,195	318	4,439,406	5,225	32,536
KY	432	3,878,941	4,336	792	5,691,557	6,811	41,411
LA	488	3,971,505	7,348	547	5,877,551	5,815	44,676
ME	370	1,660,910	716	11,582	2,729,865	1,597	20,823
MD	578	5,996,355	10,364	781	8,063,212	11,223	88,610
MA	824	10,066,833	3,208	920	10,858,949	3,834	88,018
MI	1,543	34,111,102	21,873	1,928	37,811,903	29,517	309,521
MN	613	7,105,891	11,251	844	10,461,033	19,226	107,207
MS	269	3,199,786	1,585	387	4,538,658	2,729	25,455
MO	515	5,689,110	7,184	701	7,472,807	7,329	63,392
MT	148	959,426	657	184	1,291,015	970	11,784
NE	195	1,092,497	2,660	234	1,659,781	2,806	15,172
NV	26	54,532	948	44	190,623	1,498	8,054
NH	217	1,998,198	1,323	322	2,859,198	934	24,069
NJ	1,408	18,165,355	21,994	1,772	24,965,970	22,686	181,526
NM	157	2,836,866	2,239	218	3,493,711	2,233	29,284
NY	1,795	23,975,737	15,521	2,069	24,991,509	18,217	218,241
NC	1,525	16,476,370	10,285	2,028	21,979,959	17,454	183,777
ND	80	538,205	352	117	625,584	863	6,772
OH	1,532	31,465,299	18,980	2,032	38,976,432	22,677	288,731
OK	341	5,326,295	6,834	436	6,139,863	7,196	96,063
OR	1,612	17,571,181	28,158	2,309	27,385,404	37,078	364,343
PA	2,162	56,183,775	17,707	2,260	59,103,718	22,158	532,465
RI	121	890,384	4,121	158	1,178,233	3,806	19,501
SC	400	4,101,623	5,946	597	4,552,738	11,030	81,853
SD	88	854,401	1,027	88	1,330,644	1,016	13,551
TN	1,002	8,535,881	23,637	1,654	10,726,942	32,485	137,076
TX	1,574	32,964,514	29,941	1,876	38,529,569	36,636	358,770
UT	182	3,284,061	3,369	218	4,092,371	3,162	38,724
VT	197	813,387	456	307	1,326,425	760	9,461
VA	736	8,065,081	10,298	1,019	9,555,429	12,410	100,120
WA	1,084	9,380,687	28,623	1,241	14,837,534	30,088	182,367
WV	185	2,282,991	479	272	2,074,757	678	12,952
WI	718	7,818,568	10,535	1,012	8,766,830	13,741	91,588
WY	47	185,530	394	55	316,605	299	2,637
Total	37,298	761,998,452	578,958	5,774,392	883,935,463	699,585	7,634,924

Source: USDA Census of Agriculture 1987, 1992, 1997 and 2002.

Table 1-1. Continued for 1997 and 2002.

State	1997			2002				
	Farms	Sq. ft. under protection	Acres in the open	Sales (\$1,000)	Farms	Sq. ft. under protection	Acres in the open	Sales (\$1,000)
AL	849	17,720,527	24,755	178,216	799	21,755,507	33,911	238,000
AK	77	1,053,170	180	10,017	112	1,330,533	184	14,220
AZ	291	7,853,964	8,298	131,519	375	16,452,049	14,811	92,726
AR	401	3,240,635	6,998	27,167	340	3,192,857	10,199	52,331
CA	4,988	173,192,317	90,544	2,210,574	4,570	208,170,829	85,227	2,525,423
CO	631	19,925,791	16,856	211,743	558	19,909,005	13,520	261,803
CT	1,133	9,586,493	12,844	172,371	695	11,236,001	6,682	235,272
DE	176	2,072,863	1,520	16,806	130	2,402,456	3,577	33,250
FL	5,121	223,439,101	121,352	1,449,951	4,721	360,517,313	119,137	1,586,371
GA	1,287	15,875,391	25,570	219,370	1,213	15,396,944	34,407	268,136
HI	1,428	22,337,757	3,351	83,159	1,425	31,162,601	4,193	95,057
ID	706	2,318,198	23,660	57,189	604	2,262,029	18,534	70,548
IL	1,665	23,559,992	40,732	299,936	1,116	16,678,521	31,155	290,976
IN	1,195	10,882,379	16,224	110,877	1,123	16,215,460	14,095	147,723
IA	819	7,590,138	9,737	73,208	567	5,626,896	8,784	89,159
KS	528	5,658,378	5,240	49,302	375	5,872,231	7,078	57,977
KY	1,103	7,886,810	9,320	56,018	1,226	10,112,025	10,682	62,538
LA	634	7,055,176	8,277	72,586	669	8,078,607	8,191	76,348
ME	926	3,152,467	7,116	29,852	783	3,089,712	2,195	24,870
MD	1,009	8,136,526	15,353	120,007	788	13,590,585	14,424	317,950
MA	1,375	12,441,420	6,891	128,192	910	11,675,189	3,280	138,828
MI	3,548	55,853,413	94,007	478,448	2,225	60,869,472	37,602	562,778
MN	1,242	11,453,686	32,933	153,313	1,004	14,569,771	28,843	183,492
MS	476	4,417,615	6,343	35,366	405	3,617,006	5,873	47,271
MO	1,062	7,044,621	13,657	89,056	946	8,420,333	12,096	102,507
MT	362	1,792,164	5,076	20,173	324	1,948,549	2,683	32,000
NE	346	1,700,792	5,311	21,791	357	2,488,384	6,149	31,800
NV	46	709,899	1,453	15,629	51	719,511	801	10,131
NH	619	4,667,770	3,273	44,957	340	3,091,206	953	55,680
NJ	2,826	27,896,482	35,357	277,957	1,865	22,161,895	37,371	364,822
NM	245	4,688,202	4,068	48,409	237	4,738,902	2,639	60,273
NY	3,346	28,781,141	47,461	290,722	2,594	31,044,277	25,862	335,644
NC	3,269	26,335,364	47,537	318,203	2,618	33,583,459	34,430	937,445
ND	123	913,220	694	8,673	78	657,126	608	8,615
OH	2,812	42,378,694	41,497	402,118	2,700	39,708,263	38,439	562,747
OK	616	6,236,827	15,080	109,004	583	11,092,295	22,352	222,639
OR	4,195	35,155,115	105,098	676,429	3,191	43,024,127	52,703	887,190
PA	3,877	58,820,856	59,803	639,778	3,120	63,278,937	37,624	109,924
RI	276	1,801,997	5,014	30,962	226	1,759,645	3,827	30,560
SC	766	8,449,828	17,486	144,313	789	10,213,810	23,018	321,678
SD	122	1,475,765	2,862	21,621	123	2,894,938	747	21,316
TN	1,846	13,007,093	41,492	213,365	2,350	17,836,110	48,336	275,712
TX	2,286	44,899,237	46,777	486,918	2,161	62,462,934	56,932	1,381,445
UT	324	5,825,277	4,141	70,160	286	8,479,487	4,725	119,382
VT	665	1,736,348	6,042	18,588	432	2,256,425	558	19,050
VA	1,671	14,256,467	26,723	166,411	1,266	16,820,158	19,830	190,043
WA	1,909	17,068,520	46,179	271,580	2,084	29,880,115	42,598	360,671
WV	558	2,617,751	5,532	19,332	382	4,394,889	821	—
WI	1,977	12,036,322	58,349	157,348	1,505	13,885,880	20,689	234,459
WY	64	391,999	451	4,132	50	261,899	877	6,375
Total	67,816	1,027,391,958	1,234,514	10,942,816	57,391	1,300,887,153	1,014,252	14,155,155

Source: USDA Census of Agriculture 1987, 1992, 1997 and 2002.

Table 1-2. Percentage change between 1987 and 2002 for the number of farms, square feet under protection, acres and sales.

State	Farms			Sq. ft. under protection			Acres			Sales		
	1987	2002	Percent Change	1987	2002	Percent Change	1987	2002	Percent Change	1987	2002	Percent Change
AL	546	799	46.337	10,311,592	21,755,507	110.98	13,047	33,911	159.914	103,596	238,000	129.74
AK	75	112	49.333	943,236	1,330,533	41.06	74	184	148.649	5,549	14,220	156.26
AZ	211	375	77.725	2,414,777	16,452,049	581.31	5,115	14,811	189.560	61,053	92,726	51.88
AR	230	340	47.826	2,266,515	3,192,857	40.87	2,539	10,199	301.694	13,288	52,331	293.82
CA	3,382	4,570	35.127	164,248,948	208,170,829	26.74	63,702	85,227	33.790	1,412,814	2,525,423	78.75
CO	402	558	38.806	13,274,311	19,909,005	49.98	9,021	13,520	49.873	87,392	261,803	199.57
CT	484	695	43.595	19,131,108	11,236,001	-41.27	8,704	6,682	-23.231	118,353	235,272	98.79
DE	96	130	35.417	1,310,210	2,402,456	83.36	951	3,577	276.130	13,488	33,250	146.52
FL	4,373	4,721	7.958	149,344,657	360,517,313	141.40	85,801	119,137	38.853	823,183	1,586,371	92.71
GA	646	1,213	87.771	7,784,680	15,396,944	97.79	12,614	34,407	172.768	94,639	268,136	183.33
HI	1,139	1,425	25.110	25,435,239	31,162,601	22.52	2,264	4,193	85.203	56,527	95,057	68.16
ID	469	604	28.785	1,470,404	2,262,029	53.84	19,659	18,534	-5.723	24,819	70,548	184.25
IL	805	1,116	38.634	14,019,397	16,678,521	18.97	24,266	31,155	28.390	160,645	290,976	81.13
IN	647	1,123	73.570	10,533,995	16,215,460	53.93	7,650	14,095	84.248	65,774	147,723	124.59
IA	357	567	58.824	4,518,800	5,626,896	24.52	5,007	8,784	75.434	38,241	89,159	133.15
KS	272	375	37.868	3,489,306	5,872,231	68.29	4,195	7,078	68.725	26,805	57,977	116.29
KY	432	1,226	183.796	3,878,941	10,112,025	160.69	4,336	10,682	146.356	27,397	62,538	128.27
LA	488	669	37.090	3,971,505	8,078,607	103.41	7,348	8,191	11.473	31,617	76,348	141.48
ME	370	783	111.622	1,660,910	3,089,712	86.03	716	2,195	206.564	11,582	24,870	114.73
MD	578	788	36.332	5,996,355	13,590,585	126.65	10,364	14,424	39.174	63,869	317,950	397.82
MA	824	910	10.437	10,066,833	11,675,189	15.98	3,208	3,280	2.244	80,867	138,828	71.67
MI	1,543	2,225	44.200	34,111,102	60,869,472	78.44	21,873	37,602	71.911	215,912	562,778	160.65
MN	613	1,004	63.785	7,105,891	14,569,771	105.04	11,251	28,843	156.359	57,966	183,492	216.55
MS	269	405	50.558	3,199,786	3,617,006	13.04	1,585	5,873	270.536	17,146	47,271	175.70
MO	515	946	83.689	5,689,110	8,420,333	48.01	7,184	12,096	68.374	57,516	102,507	78.22
MT	148	324	118.919	959,426	1,948,549	103.10	657	2,683	308.371	7,377	32,000	333.78
NE	195	357	83.077	1,092,497	2,488,384	127.77	2,660	6,149	131.165	9,545	31,800	233.16
NV	26	51	96.154	54,532	719,511	1219.43	948	801	-15.506	2,511	10,131	303.46
NH	217	340	56.682	1,998,198	3,091,206	54.70	1,323	953	-27.967	18,410	55,680	202.44
NJ	1,408	1,865	32.457	18,165,355	22,161,895	22.00	21,994	37,371	69.915	152,762	364,822	138.82
NM	157	237	50.955	2,836,866	4,738,902	67.05	2,239	2,639	17.865	21,529	60,273	179.96
NY	1,795	2,594	44.513	23,975,737	31,044,277	29.48	15,221	25,862	66.626	168,242	335,644	99.50
NC	1,525	2,618	71.672	16,476,370	33,583,459	103.83	10,285	34,430	234.759	113,817	937,445	723.64
ND	80	78	-2.500	538,205	657,126	22.10	352	608	72.727	4,490	8,615	91.87
OH	1,532	2,700	76.240	31,465,299	39,708,263	26.20	18,980	38,439	102.524	209,031	562,747	169.22
OK	341	583	70.968	5,326,295	11,092,295	108.26	6,834	22,352	227.071	61,822	222,639	260.13
OR	1,612	3,191	97.953	17,571,181	43,024,127	144.86	28,158	52,703	87.169	205,723	887,190	331.25
PA	2,162	3,120	44.311	56,183,775	63,278,937	12.63	17,707	37,624	112.481	398,115	109,924	-72.39
RI	121	226	86.777	890,384	1,759,645	97.63	4,121	3,827	-7.134	20,786	30,560	47.02
SC	400	789	97.250	4,101,623	10,213,810	149.02	5,946	23,018	287.117	55,990	321,678	474.53
SD	88	123	39.773	854,401	2,894,938	238.83	1,027	747	-27.264	7,875	21,316	170.68
TN	1,002	2,350	134.531	8,535,881	17,836,110	108.95	23,637	48,336	104.493	108,772	275,712	153.48
TX	1,574	2,161	37.294	32,964,514	62,462,934	89.49	29,941	56,932	90.147	239,235	1,381,445	477.44
UT	182	286	57.143	3,284,061	8,479,487	158.20	3,369	4,725	40.249	24,484	119,382	387.59
VT	197	432	119.289	813,387	2,256,425	177.41	456	558	22.368	4,983	19,050	282.30
VA	736	1,266	72.011	8,065,081	16,820,158	108.56	10,298	19,830	92.562	72,233	190,043	163.10
WA	1,084	2,084	92.251	9,380,687	29,880,115	218.53	28,623	42,598	48.824	119,315	360,671	202.28
WV	185	382	106.486	2,282,991	4,394,889	92.51	479	821	71.399	9,939	---	---
WI	718	1,505	109.610	7,818,568	13,885,880	77.60	10,535	20,689	96.383	65,793	234,459	256.36
WY	47	50	6.383	185,530	261,899	41.16	394	877	122.589	1,575	6,375	304.76
Total	37,298	57,391	53.872	761,998,452	1,300,887,153	70.72	578,958	1,014,252	75.186	5,774,392	14,155,155	145.14

Source: USDA Census of Agriculture 1992 and 2002

Table 2-1. Economic impacts of U.S. green industry by region and industry.

Region	Output Impacts (\$Mn)*				Employment Impacts (jobs)				Value Added Impacts (\$Mn)*			
	All Sectors	Prod. & Manuf.	Hort. Service	Trade	All Sectors	Prod. & Manuf.	Hort. Service	Trade	All Sectors	Prod. & Manuf.	Hort. Service	Trade
East	41,118	8,543	17,282	15,293	540,496	82,198	208,434	249,865	27,033	5,494	11,749	9,790
Central	34,825	7,017	11,887	15,920	439,955	46,114	136,824	257,016	21,070	3,142	7,958	9,970
South	34,559	10,189	12,270	12,100	498,420	93,753	188,420	216,247	22,150	6,301	8,194	7,656
West	37,326	8,829	16,335	12,162	485,467	78,612	219,879	186,976	24,830	5,859	11,112	7,859
All Regions	147,828	34,578	57,774	55,475	1,964,338	300,677	753,557	910,104	95,083	20,796	39,013	35,275

Table 3-1. States surveyed in 1989 and 2004 along with frequency of responses from that state.

State	1989 Frequency	2004 Frequency	State	1989 Frequency	2004 Frequency
Alabama	29	—	Montana	—	11
Alaska	—	—	Nebraska	—	25
Arizona	38	—	Nevada	—	11
Arkansas	20	28	New Hampshire	—	16
California	137	126	New Jersey	106	64
Colorado	—	17	New Mexico	—	17
Connecticut	26	23	New York	100	178
Delaware	28	25	North Carolina	106	95
Florida	104	476	North Dakota	—	13
Georgia	150	56	Ohio	108	121
Hawaii	—	14	Oklahoma	38	15
Idaho	—	14	Oregon	64	148
Illinois	32	88	Pennsylvania	91	156
Indiana	—	34	Rhode Island	—	12
Iowa	—	24	South Carolina	31	34
Kansas	—	—	South Dakota	—	16
Kentucky	21	25	Tennessee	98	96
Louisiana	55	50	Texas	—	66
Maine	25	46	Utah	—	22
Maryland	—	—	Vermont	—	16
Massachusetts	—	18	Virginia	—	51
Michigan	85	98	Washington	—	24
Minnesota	—	38	West Virginia	—	30
Mississippi	12	19	Wisconsin	—	—
Missouri	—	17	Wyoming	—	12
			Total	1504	2485

Table 3-2. Questions from 2004 survey along with response and any modifications made for comparison.

Question #	Question	Response	Modifications for comparison
	ID	Number	
	Code	Number	
1	From what state are you reporting	State Code	
	ZIP code	Zip Code	
	Does your business operate in another state	Yes/No	
	State 1	State code	
	State 2	State Code	
	State 3	State Code	4th State code in 1989 not used in 2004
2	In what year was your firm established	Year	Grouped into 5 year intervals
3	How many people does your firm employ at this location		
	Permanent	Number	Grouped into 10 or fewer and 11 or more
	Temporary	Number	
	Has the number of employees over the last five years		
	Permanent		
	Increased	Yes/No	Not included in 1989
	Stayed the same	Yes/No	Not included in 1989
	Decreased	Yes/No	Not included in 1989
	Temporary		
	Increased	Yes/No	Not included in 1989
	Stayed the same	Yes/No	Not included in 1989
	Decreased	Yes/No	Not included in 1989
	If employment has changed, indicate by what percent		
	Permanent	Percentage	Not included in 1989
	Temporary	Percentage	Not included in 1989
4	What functions of your firm are computerized		
	Word processing	Yes/No	
	Accounting/cost analysis	Yes/No	
	Inventory	Yes/No	
	Financial investments/analysis	Yes/No	
	Internet commerce	Yes/No	Renamed as marketing
	CDs for marketing	Yes/No	Renamed as marketing
	Communications- E-mail	Yes/No	Renamed as communications
	Landscape designing (CAD)	Yes/No	Not included in 1989
	Production scheduling	Yes/No	Not included in 1989
	Greenhouse production controls	Yes/No	Not included in 1989
	Digital imaging for disease diagnosis	Yes/No	Not included in 1989
	Bar coding	Yes/No	Not included in 1989
	Other	Any other functions not	

Table 3-2. Continued.

Question #	Question	Response	Modifications for comparison
5	What percentage of your sales are in these plant categories		
	Deciduous shade/flowering trees	Percentage	
	Deciduous shrubs	Percentage	
	Broad-leaved evergreen (excl azaleas)	Percentage	
	Narrow-leaved evergreen shrubs	Percentage	
	Evergreen trees	Percentage	
	Azaleas	Percentage	Combined with broad-leaved evergreen
	Vines and ground covers	Percentage	
	Roses	Percentage	
	Herbaceous perennials	Percentage	
	Bedding plants - flowering annuals	Percentage	Not included in 1989
	Bedding plants - vegetables, fruits and herbs	Percentage	Not included in 1989
	Flowering potted plants	Percentage	Not included in 1989
	Christmas trees (live or cut)	Percentage	Not included in 1989
	Tree fruits	Percentage	
	Foliage	Percentage	Not included in 1989
	Propagated material (liners, cuttings, plugs, etc.)	Percentage	
	Other	Percentage	
6	What is your firm's source of irrigation water		
	Natural surface	Percentage	Not included in 1989
	Recaptured	Percentage	Not included in 1989
	City	Percentage	Not included in 1989
	Well	Percentage	Not included in 1989
7	Has your use of irrigation water on a per-acre basis changed over the past five years		
	Increased	Yes/No	Not included in 1989
	Remained the same	Yes/No	Not included in 1989
	Decreased	Yes/No	Not included in 1989
	If irrigation water has changed, indicate by what percent	Percentage	Not included in 1989
	Irrigation methods used		
	Overhead	Yes/No	Not included in 1989
	Sub-irrigation	Yes/No	Not included in 1989
	Drip	Yes/No	Not included in 1989
	Other	Yes/No	Not included in 1989
8	Please place a check mark beside each of the following IPM activates that you practice	Yes/No	Not included in 1989
9	Considering all plants sold by your firm, what percentage of your sales are in these forms		
	Bare root	Percentage	
	Balled and potted	Percentage	
	Balled and burlapped	Percentage	
	Processed balled	Percentage	
	Container	Percentage	
	Field grow bag	Percentage	
	In-ground containers	Percentage	
	Other	Percentage	

Table 3-2. Continued.

Question #	Question	Response	Modifications for comparison
10	What are the top five states, including your own state, from which you purchase seedlings, liners, whips, grafted material, Tissue culture plantlets, cuttings or plugs	State code and percentage	1989 had six possible states, but only a few were listed
11	What percent of total sales is from native plants	Percentage	Not included in 1989
12	At how many trade shows was your firm represented in 2003	Number	Not included in 1989
	With an exhibit	Number	
	Without an exhibit	Number	Combined into one category
13	What percentage of your sales are done with repeat customers	Percentage	Not included in 1989
14	Do you publish discount information for large-volume purchase	Yes/No	Not included in 1989
15	What percent of your sales are negotiated sales	Percentage	Not included in 1989
16	What percentage of your sales transactions are made using the following methods		
	Trade show orders	Percentage	1989 has same categories but listed as negotiated and nonnegotiated. Negotiated and nonnegotiated were combined.
	Telephone orders	Percentage	
	In-person orders	Percentage	
	Mail orders	Percentage	
	Internet sales	Percentage	Not included in 1989
17	What percentage of your 2003 total annual sales are		
	Wholesale	Percentage	
	Retail	Percentage	
18	If you sell wholesale, what percentage of your wholesale sales are to		
	Mass merchandisers	Percentage	
	Home centers	Percentage	Combined with mass merchandisers
	Garden centers (single locations)	Percentage	Combined with mass merchandisers
	Garden centers (multiple locations)	Percentage	Combined with mass merchandisers
	Landscape firms	Percentage	
	Re-wholesalers	Percentage	
19	Do you export nursery products out of the US	Yes/No	
	If yes, what percentage of total sales is from exports	Percentage	
	If you export, please list the countries	Country code	
20	What are the top five states, including your own state, that are destinations for your firm's total sales		1989 had six possible states, but only a few were listed
	State 1		
	State 2		
	State 3		
	State 4	State code and percentage	
	State 5	State code and percentage	
	All other out-of-state sales combined	Percentage	1989 listed 6 states, but there were almost no entries
21	Do you handle/resell items for other growers	Yes/No	Not included in 1989
	If yes, what percentage of your total sales does this account for	Percentage	Not included in 1989

Table 3-2. Continued.

Question #	Question	Response	Modifications for comparison
22	What percentage of your total sales are on contract	Percentage	Not included in 1989
23	What types of buyer(s) are contracting for production with your firm		
	Other producers	Yes/No	Not included in 1989
	Mass merchandisers	Yes/No	Not included in 1989
	Retail garden centers	Yes/No	Not included in 1989
	Cooperatives	Yes/No	Not included in 1989
	Other	Yes/No	Not included in 1989
24	Regarding price determination, please rate the level of importance of each factor		
	Cost of production	1 to 4 with 1=not important to 4=very important	1989 asked respondents to indicate the top five choices in descending order
	Inflation		
	Other growers' prices		
	Grade of plants		
	Market demand		
	Product uniqueness		Combined with other because not included in 1989
	Inventory levels		
	Last year's price		
	Other		
25	Regarding factors that might limit the expansion of the geographic scope of your trading area, please rate the level of importance of each factor		
	Debt capital	1 to 4 with 1=not important to 4=very important	Not included in 1989
	Equity capital		Not included in 1989
	Marketing		Not included in 1989
	Personnel		Not included in 1989
	Production		Not included in 1989
	Transportation		Not included in 1989
	Plant offering		Not included in 1989
26	Please rate each of the factors listed below according to how much they impact your business		
	Weather uncertainty	1 to 4 with 1=not important to 4=very important	Not included in 1989
	Land		Not included in 1989
	Market demand		Not included in 1989
	Labor		Not included in 1989
	Water supply		Not included in 1989
	Debt capital		Not included in 1989
	Equity capital		Not included in 1989
	Own managerial expertise		Not included in 1989
	Competition/price undercutting		Not included in 1989
	Environmental regulations		Not included in 1989
	Other government regulations		Not included in 1989
	Ability to hire competent management		Not included in 1989
	Ability to hire competent hourly employees		Not included in 1989

Table 3-2. Continued.

Question #	Question	Response	Modifications for comparison
27	What percentage of total sales did your firm spend on advertising in 2003	Percentage	
	How do you allocate these advertising dollars		
	Web sites	Percentage	Combined with other because not included in 1989
	Yellow pages	Percentage	
	Radio/TV	Percentage	
	Billboards	Percentage	
	Gardening publications	Percentage	Combined with other because not included in 1989
	Catalogs (print or CD)	Percentage	
	Trade journals	Percentage	
	Newsletters	Percentage	
	Trade shows	Percentage	
	Other	Percentage	Other also includes newspapers which was listed in 1989
28	What was the gross value of product sales from your nursery in 2003, or your most recently completed fiscal year?		
	Less than \$249,999	Check the appropriate category	The income categories on the 1989 survey were different from the 2004. The values will be converted to cell midpoints and converted to 2004 dollars.
	\$250,000 - \$499,999	Check the appropriate category	
	\$500,000 - \$999,999	Check the appropriate category	
	\$1,000,000 - \$1,999,999	Check the appropriate category	
	\$2,000,000 - \$2,999,999	Check the appropriate category	
	\$3,000,000 - \$3,999,999	Check the appropriate category	
	\$4,000,000 - \$4,999,999	Check the appropriate category	
	\$5,000,000 - \$9,999,999	Check the appropriate category	
	\$10,000,000 - \$14,999,99	Check the appropriate category	
	\$15,000,000 - \$19,999,999	Check the appropriate category	
	\$20,000,000 or above	Check the appropriate category	

Table 3-3. States placed into their region.

Southern Region	Northern Region	Western* Region
AR	CT	CA
FL	DE	OR
GA	IL	
KY	ME	
LA	MI	
MS	NJ	
NC	NY	
OK	OH	
SC	PA	
TN		

***Only two states in the western region reported for both surveys. These two states accounted for approximately 24.1 percent of total U.S. nursery sales for 2002 (NASS 2002).**

Table 4-1. Mean percentage of sales in plant categories for 1988 and 2003 for the northern, southern and western regions.

Northern Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Deciduous shade/flowering trees	796	11.62	21.66	601	19.39	25.81	-12.34 *
Deciduous shrubs	796	5.93	11.16	601	9.18	12.92	-10.15 *
Broad-leaved evergreen(excl azaleas)	796	4.59	11.86	601	9.48	17.31	-12.64 *
Narrow-leaved evergreen shrubs	796	3.39	9.48	601	12.29	19.56	-22.63 *
Evergreen trees	796	14.93	27.67	601	28.54	35.74	-16.21 *
Vines and ground covers	796	1.39	5.22	601	3.94	14.82	-9.10 *
Roses	796	0.76	2.65	601	0.85	2.73	-1.23
Herbaceous perennials	796	11.07	24.10	601	4.63	16.81	11.32 *
Christmas trees (live or cut)	796	13.34	30.55	601	1.85	12.01	17.63 *
Tree fruits	796	0.52	4.62	601	2.91	13.14	-9.60 *
Propagated material (liners, cuttings)	796	2.21	11.30	601	3.13	14.54	-2.70 *

Southern Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Deciduous shade/flowering trees	895	13.63	24.68	635	21.93	28.44	-12.34 *
Deciduous shrubs	895	4.78	13.38	635	5.39	11.27	-1.89
Broad-leaved evergreen(excl azaleas)	895	12.24	22.41	635	22.27	27.34	-15.96 *
Narrow-leaved evergreen shrubs	895	3.13	9.12	635	10.52	17.12	-22.16 *
Evergreen trees	895	7.14	18.16	635	12.94	25.04	-10.66 *
Vines and ground covers	895	3.15	11.34	635	5.45	15.17	-6.89 *
Roses	895	1.02	6.05	635	0.96	5.04	0.40
Herbaceous perennials	895	4.70	15.73	635	3.04	13.52	4.39 *
Christmas trees (live or cut)	895	2.46	13.26	635	1.35	10.20	3.59 *
Tree fruits	895	3.30	15.69	635	4.08	14.85	-1.98 **
Propagated material (liners, cuttings)	895	5.16	18.51	635	6.72	20.57	-3.16 *

Western Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Deciduous shade/flowering trees	276	12.11	25.29	201	13.67	25.32	-1.35
Deciduous shrubs	276	4.17	10.33	201	3.84	11.71	0.67
Broad-leaved evergreen(excl azaleas)	276	7.89	17.88	201	16.28	26.14	-8.42 *
Narrow-leaved evergreen shrubs	276	2.91	10.15	201	8.02	16.48	-8.46 *
Evergreen trees	276	6.85	17.69	201	10.81	22.69	-4.33 *
Vines and ground covers	276	2.28	8.53	201	7.08	20.52	-7.08 *
Roses	276	2.65	14.25	201	3.44	15.11	-1.19
Herbaceous perennials	276	10.00	23.15	201	7.05	20.85	2.90 *
Christmas trees (live or cut)	276	1.15	8.46	201	11.83	30.75	-11.13 *
Tree fruits	276	3.40	15.19	201	4.24	16.29	-1.18
Propagated material (liners, cuttings)	276	5.39	19.11	201	7.77	24.17	-2.43 *

*Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.

Table 4-2. Mean percentage of sales forms in 1988 and 2003.

Northern Region							
Forms	2003			1988			t-value
	N	Mean	STD Dev	N	Mean	STD Dev	
Bare root	796	6.46	21.84	601	9.95	25.50	-5.56 *
Balled and potted	796	6.39	20.13	601	5.02	17.19	2.70 *
Balled and burlapped	796	32.81	41.54	601	46.21	39.33	-12.33 *
Processed balled	796	0.55	6.36	601	0.90	6.14	-2.12 *
Container	796	42.93	43.71	601	28.10	34.29	13.89 *
Field grow bag	796	0.93	7.72	601	0.96	6.64	-0.11 *

Southern Region							
Forms	2003			1988			t-value
	N	Mean	STD Dev	N	Mean	STD Dev	
Bare root	895	8.58	25.32	635	10.17	24.91	-2.48 **
Balled and potted	895	2.43	13.15	635	1.45	8.42	3.37 *
Balled and burlapped	895	14.75	31.13	635	30.25	39.27	-17.45 *
Processed balled	895	0.17	3.44	635	0.46	4.40	-3.00 *
Container	895	62.46	43.88	635	53.14	44.07	8.29 *
Field grow bag	895	1.42	10.41	635	1.06	8.29	1.48

Western Region							
Forms	2003			1988			t-value
	N	Mean	STD Dev	N	Mean	STD Dev	
Bare root	276	12.56	29.80	201	14.64	32.90	-1.46
Balled and potted	276	5.35	19.11	201	2.01	10.61	4.53 *
Balled and burlapped	276	6.98	21.13	201	8.32	22.22	-1.36
Processed balled	276	0.81	8.54	201	0.06	0.52	2.52 **
Container	276	61.57	44.18	201	68.20	42.44	-3.33 *
Field grow bag	276	0.91	7.34	201	0.08	1.06	3.23 *

*Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.

Table 4-3. Mean number of trade shows participated in by nursery growers, 1988 and 2003.

Northern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
796	1.05	3.64	601	1.26	3.95	-2.08*

Southern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
895	1.53	2.75	635	1.82	5.59	-2.78*

Western Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
276	1.38	3.07	201	2.13	5.72	-3.76*

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-4. Mean percentage of sales transactions with repeat customers for 1988 and 2003.

Northern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
796	69.71	27.63	601	70.18	26.47	-0.65

Southern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
895	73.79	27.59	635	75.01	24.15	-1.81

Western Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
276	71.20	28.62	201	78.74	24.44	-6.11*

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-5. Mean percentage of sales transactions methods for 1988 and 2003.

Northern Region							
Methods	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Trade show orders	796	1.93	7.80	601	4.64	12.33	-10.14 *
Telephone orders	796	28.89	34.10	601	34.18	31.55	-5.99 *
In-person orders	796	60.32	39.45	601	55.11	36.03	5.12 *
Mail orders	796	2.83	11.77	601	6.06	16.81	-8.53 *

Southern Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Trade show orders	895	3.15	9.83	635	6.81	13.02	-12.61 *
Telephone orders	895	42.41	37.02	635	39.16	31.82	3.59 *
In-person orders	895	47.51	38.58	635	49.41	35.30	-1.97 **
Mail orders	895	3.23	14.04	635	4.62	15.23	-3.68 *

Western Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Trade show orders	276	2.77	8.23	201	3.16	8.92	-0.97
Telephone orders	276	36.76	36.05	201	38.17	32.94	-0.87
In-person orders	276	51.28	39.42	201	52.97	34.71	-0.96
Mail orders	276	6.29	18.13	201	5.70	14.72	0.75

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-6. Mean percentage of total sales to wholesale and retail outlets for 1988 and 2003.

Northern Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Wholesale	771	47.43	42.84	578	65.51	39.26	-16.06*
Retail	771	52.57	42.84	578	34.49	39.26	16.06*

Southern Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Wholesale	870	72.71	39.50	620	79.71	33.40	-7.28*
Retail	870	27.29	39.50	620	20.29	33.40	7.28*

Western Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Wholesale	270	64.16	43.40	191	85.15	29.06	-11.82*
Retail	270	35.84	43.40	191	14.85	29.06	11.82*

*Significant at the 0.01 level **significant at the 0.05 level. A significant *t*-test is justification for rejecting the null hypothesis that the means are not different between the two years.

Table 4-7. Mean percentage of sales for wholesale categories for 1988 and 2003.

Northern Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Mass merchandisers	796	23.50	35.29	516	29.46	29.77	-6.50 *
Landscape firms	796	33.37	40.63	516	49.70	35.22	-15.33 *
Re-wholesalers	796	14.49	28.33	516	20.83	27.74	-8.18 *

Southern Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Mass merchandisers	895	22.39	33.20	572	31.29	30.37	-10.61 *
Landscape firms	895	31.35	37.06	572	38.82	32.55	-8.09 *
Re-wholesalers	895	27.65	35.72	572	29.88	32.52	-2.48 **

Western Region							
	2003			1988			
Categories	N	Mean	STD Dev	N	Mean	STD Dev	t-value
Mass merchandisers	276	28.77	38.20	184	39.58	33.99	-6.34 *
Landscape firms	276	17.76	31.48	184	26.77	32.63	-6.04 *
Re-wholesalers	276	28.03	37.16	184	33.65	33.73	-3.36 *

*Significant at the 0.01 level **significant at the 0.05 level. A significant *t*-test is justification for rejecting the null hypothesis that the means are not different between the two years.

Table 4-8. Mean percentage of total sales from exports for 1988 and 2003.

Northern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
796	0.15	1.30	601	0.50	4.31	-4.43*

Southern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
895	0.72	4.09	635	0.85	5.58	-1.10

Western Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
276	1.68	7.42	201	2.12	7.63	-1.28

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-9. Mean percentage of total sales spent on advertising and allocation of advertising dollars¹ or 1988 and 2003.

Northern Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Percentage of total sales	704	3.76	5.35	601	2.07	3.58	13.25 *
Yellow pages	462	\$4,020	\$19,980	580	\$1,414	\$4,256	6.15 *
Radio/TV	462	4,553	40,926	580	639	4,130	4.61 *
Billboards	462	321	1,937	580	373	3,761	0.54
Catalogs	462	19,874	190,302	580	5,145	26,309	3.71 *
Trade journals	462	2,188	11,102	580	3,292	26,507	-1.69
Newsletters	462	3,519	19,402	580	2,418	11,111	2.31 **
Trade shows	462	6,420	31,419	580	3,523	21,368	3.56 *
Other	462	7,790	45,712	580	8,946	51,217	-0.76

Southern Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Percentage of total sales	776	3.94	7.56	635	2.42	5.20	8.63 *
Yellow pages	517	\$3,755	\$18,220	598	\$2,984	\$35,333	0.90
Radio/TV	517	1,498	10,275	598	104	833	6.63 *
Billboards	517	149	1,219	598	74	862	2.40 **
Catalogs	517	9,831	84,718	598	3,444	14,847	3.63 *
Trade journals	517	5,814	30,567	598	1,986	8,774	5.87 *
Newsletters	517	1,377	7,782	598	1,784	12,994	-1.25
Trade shows	517	24,567	181,630	598	6,076	26,292	4.93 *
Other	517	15,958	221,161	598	5,265	53,764	2.29 **

Western Region							
Categories	2003			1988			t- value
	N	Mean	STD Dev	N	Mean	STD Dev	
Percentage of total sales	235	3.77	7.90	201	1.81	7.50	5.30 *
Yellow pages	157	\$4,891	\$26,566	195	\$3,080	\$19,602	1.48
Radio/TV	157	970	7,462	195	40	415	3.50 *
Billboards	157	26	212	195	0	0	3.49 *
Catalogs	157	6,668	26,381	195	14,566	141,675	-1.39
Trade journals	157	3,276	12,714	195	11,751	108,131	-1.96 **
Newsletters	157	5,392	41,182	195	1,988	12,894	2.19 **
Trade shows	157	8,746	24,066	195	4,675	22,968	3.26 *
Other	157	5,073	11,288	195	9,888	76,102	-1.58

*Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years. ¹ Values expressed in 2003 dollars (GDP Implicit Price Deflator, U.S. Department of Commerce).

Table 4-10. Mean gross value of nursery product sales for 1988 and 2003.

Northern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
755	\$ 1,081,286	\$ 3,205,730	572	\$ 827,703	\$ 2,820,428	3.03*

Southern Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
855	\$ 1,261,759	\$ 3,371,786	587	\$ 588,256	\$ 1,229,246	9.43*

Western Region						
2003			1988			
N	Mean	STD Dev	N	Mean	STD Dev	t- value
264	\$ 1,683,769	\$ 4,307,559	194	\$ 1,305,419	\$ 2,337,164	2.24**

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-11. Number of businesses which operate or do not operate in another state for 1988 and 2003.

Northern Region						
2003			1988			
N	Yes	No	N	Yes	No	t- value
796	11	785	601	20	581	-2.32**

Southern Region						
2003			1988			
N	Yes	No	N	Yes	No	t- value
895	21	874	635	19	616	-0.77

Western Region						
2003			1988			
N	Yes	No	N	Yes	No	t- value
276	7	269	201	3	198	0.82

***Significant at the 0.01 level **significant at the 0.05 level. A significant t-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-12. Number of firms exporting nursery products out of the U.S for 1988 and 2003.

Northern Region

2003			1988			<i>t</i> -value
N	Yes	No	N	Yes	No	
796	32	764	601	51	550	-3.35*

Southern Region

2003			1988			<i>t</i> -value
N	Yes	No	N	Yes	No	
895	103	792	635	73	562	0.01

Western Region

2003			1988			<i>t</i> -value
N	Yes	No	N	Yes	No	
276	52	224	201	59	142	-2.64*

***Significant at the 0.01 level **significant at the 0.05 level. A significant *t*-test is justification for rejecting the null hypothesis that the means are not different between the two years.**

Table 4-13. Computerized functions of firms shown as frequencies and percentages for 1988 and 2003.

Northern Region

Function	2003						1988						chi-square		
	Neither		Planned		Now		Neither		Planned		Now				
	N	%	Num	%	Num	%	N	%	Num	%	Num	%			
Word processing	796	293	36.8	22	2.8	481	60.4	421	321	76.2	80	19.0	20	4.8	379.87 *
Accounting	796	321	40.3	57	7.2	418	52.5	601	252	41.9	133	22.1	216	35.9	77.36 *
Inventory	796	411	51.6	91	11.4	294	36.9	601	284	47.3	159	26.5	158	26.3	56.51 *
Financial Investments	796	551	69.2	45	5.7	200	25.1	601	508	84.5	59	9.8	34	5.7	96.04 *
Internet Commerce	796	539	67.7	64	8.0	193	24.2	601	460	76.5	71	11.8	70	11.6	37.65 *

Southern Region

Function	2003						1988						chi-square		
	Neither		Planned		Now		Neither		Planned		Now				
	N	%	Num	%	Num	%	N	%	Num	%	Num	%			
Word processing	895	312	34.9	23	2.6	560	62.6	635	427	67.2	81	12.8	127	20.0	287.26 *
Accounting	895	314	35.1	63	7.0	518	57.9	635	327	51.5	122	19.2	186	29.3	135.37 *
Inventory	895	441	49.3	103	11.5	351	39.2	635	355	55.9	159	25.0	121	19.1	91.81 *
Financial Investments	895	630	70.4	59	6.6	206	23.0	635	559	88.0	41	6.5	35	5.5	87.15 *
Internet Commerce	895	575	64.2	67	7.5	253	28.3	635	494	77.8	80	12.6	61	9.6	82.90 *

Western Region

Function	2003						1988						chi-square		
	Neither		Planned		Now		Neither		Planned		Now				
	N	%	Num	%	Num	%	N	%	Num	%	Num	%			
Word processing	276	73	26.4	5	1.8	198	71.7	201	79	39.3	34	16.9	88	43.8	53.64 *
Accounting	276	76	27.5	14	5.1	186	67.4	201	56	27.9	49	24.4	96	47.8	40.40 *
Inventory	276	115	41.7	27	9.8	134	48.6	201	72	35.8	52	25.9	77	38.3	21.95 *
Financial Investments	276	182	65.9	14	5.1	80	29.0	201	162	80.6	17	8.5	22	10.9	23.21 *
Internet Commerce	276	164	59.4	21	7.6	91	33.0	201	128	63.7	28	13.9	45	22.4	9.44 *

***Significant at 0.05 level. A significant chi-square is justification for rejecting the null hypothesis that the response patterns do not vary systematically by survey by region.**

Table 4-14. Number and percentage of firms for years in operation in 1988 and 2003.

Northern Region					
Years	2003		1988		chi-square
	Num	%	Num	%	
Less than 5	70	8.8	77	12.8	46.21*
5 to 10	84	10.6	101	16.8	
10 to 15	81	10.2	79	13.1	
15 to 20	135	17.0	61	10.1	
20 to 25	90	11.3	34	5.7	
25 to 30	78	9.8	40	6.7	
Greater than 30	258	32.4	209	34.8	
Total	796		601		

Southern Region					
Years	2003		1988		chi-square
	Num	%	Num	%	
Less than 5	137	15.3	107	16.9	61.10*
5 to 10	125	14.0	155	24.4	
10 to 15	108	12.1	104	16.4	
15 to 20	134	15.0	69	10.9	
20 to 25	106	11.8	33	5.2	
25 to 30	93	10.4	35	5.5	
Greater than 30	192	21.5	132	20.8	
Total	895		635		

Western Region					
Years	2003		1988		chi-square
	Num	%	Num	%	
Less than 5	45	16.3	31	15.4	2.74
5 to 10	48	17.4	40	19.9	
10 to 15	43	15.6	32	15.9	
15 to 20	30	10.9	16	8.0	
20 to 25	20	7.2	11	5.5	
25 to 30	23	8.3	15	7.5	
Greater than 30	67	24.3	56	27.9	
Total	276		201		

***Significant at 0.05 level. A significant chi-square is justification for rejecting the null hypothesis that the response patterns do not vary systematically by survey by region.**

Table 4-15. Number and percentage of firms with less than and more than 10 employees for both permanent and temporary for 1988 and 2003.

Northern Region

	2003		1988		chi-square
	Num	%	Num	%	
Employees					
Permanent (≤ 10 employees)	709	44.5	499	41.5	17.18*
Permanent (> 10 employees)	87	5.5	102	8.5	
Temporary (≤ 10 employees)	628	39.4	439	36.5	
Temporary (> 10 employees)	168	10.6	162	13.5	
Total	1592		1202		

Southern Region

	2003		1988		chi-square
	Num	%	Num	%	
Employees					
Permanent (≤ 10 employees)	699	39.1	482	38.0	2.73
Permanent (> 10 employees)	196	10.9	153	12.0	
Temporary (≤ 10 employees)	808	45.1	560	44.1	
Temporary (> 10 employees)	87	4.9	75	5.9	
Total	1790		1270		

Western Region

	2003		1988		chi-square
	Num	%	Num	%	
Employees					
Permanent (≤ 10 employees)	213	38.6	122	30.3	15.39*
Permanent (> 10 employees)	63	11.4	79	19.7	
Temporary (≤ 10 employees)	224	40.6	167	41.5	
Temporary (> 10 employees)	52	9.4	34	8.5	
Total	552		402		

***Significant at 0.05 level. A significant chi-square is justification for rejecting the null hypothesis that the response patterns do not vary systematically by survey by region.**

Table 4-16. Number and percentage of small and large firms for 1988 and 2003.

Northern Region					
Size	2003		1988		chi-square
	Num	%	Num	%	
Small**	442	62.2	22	45.8	5.05*
Large**	269	37.8	26	54.2	
Total	711		48		

Southern Region					
Size	2003		1988		chi-square
	Num	%	Num	%	
Small**	395	49.0	15	42.9	0.51
Large**	411	51.0	20	57.1	
Total	806		35		

Western Region					
Size	2003		1988		chi-square
	Num	%	Num	%	
Small**	141	55.3	75	51.7	0.47
Large**	114	44.7	70	48.3	
Total	255		145		

***Significant at 0.05 level. A significant chi-square is justification for rejecting the null hypothesis that the response patterns do not vary systematically by survey by region. **Small is classified as below \$499,999 for 1988 and below \$249,999 for 2003. Large is classified as anything above the small level for both 1988 and 2003.**

Table 4-17. Number and percentage of firms for ranking factors affecting nursery business for 1988 and 2003*.

Northern Region				
Factor	1988		2003	
	Num.	%	Num.	%
Weather uncertainty	92	15.31	589	73.99
Land	86	14.31	365	45.85
Market demand	129	21.46	654	82.16
Labor	101	16.81	438	55.03
Water supply	97	16.14	326	40.95
Own managerial expertise	110	18.30	470	59.05
Competition	99	16.47	385	48.37
Env. regulations	67	11.15	322	40.45
Competent management	89	14.81	285	35.80

Southern Region				
Factor	1988		2003	
	Num.	%	Num.	%
Weather uncertainty	117	18.43	616	68.83
Land	72	11.34	400	44.69
Market demand	112	17.64	766	85.59
Labor	134	21.10	525	58.66
Water supply	85	13.39	444	49.61
Own managerial expertise	97	15.28	525	58.66
Competition	126	19.84	497	55.53
Env. regulations	92	14.49	442	49.39
Competent management	89	14.02	384	42.91

Western Region				
Factor	1988		2003	
	Num.	%	Num.	%
Weather uncertainty	25	12.44	164	59.42
Land	22	10.95	116	42.03
Market demand	44	21.89	233	84.42
Labor	34	16.92	149	53.99
Water supply	33	16.42	139	50.36
Own managerial expertise	25	12.44	154	55.80
Competition	29	14.43	138	50.00
Env. regulations	18	8.96	115	41.67
Competent management	29	14.43	103	37.32

*For the 1988 data a 1 to 5 scale was used and in 2003 a 1 to 4 scale was used. Only the responses of 4/5 and 3/4 were used in the examination of factors important to nursery business.

Table 4-18. Number and percentage of firms for ranking of factors important to price determination for 1988 and 2003*.

Northern Region

Factor	1988		2003	
	Num.	%	Num.	%
Cost of production	87	14.48	634	79.65
Inflation	133	22.13	285	35.80
Other growers' prices	134	22.30	506	63.57
Grade of plants	117	19.47	643	80.78
Market demand	162	19.47	593	74.50
Inventory levels	203	26.96	408	51.26
Last years price	172	33.78	453	56.91
Other	15	2.50	22	2.76

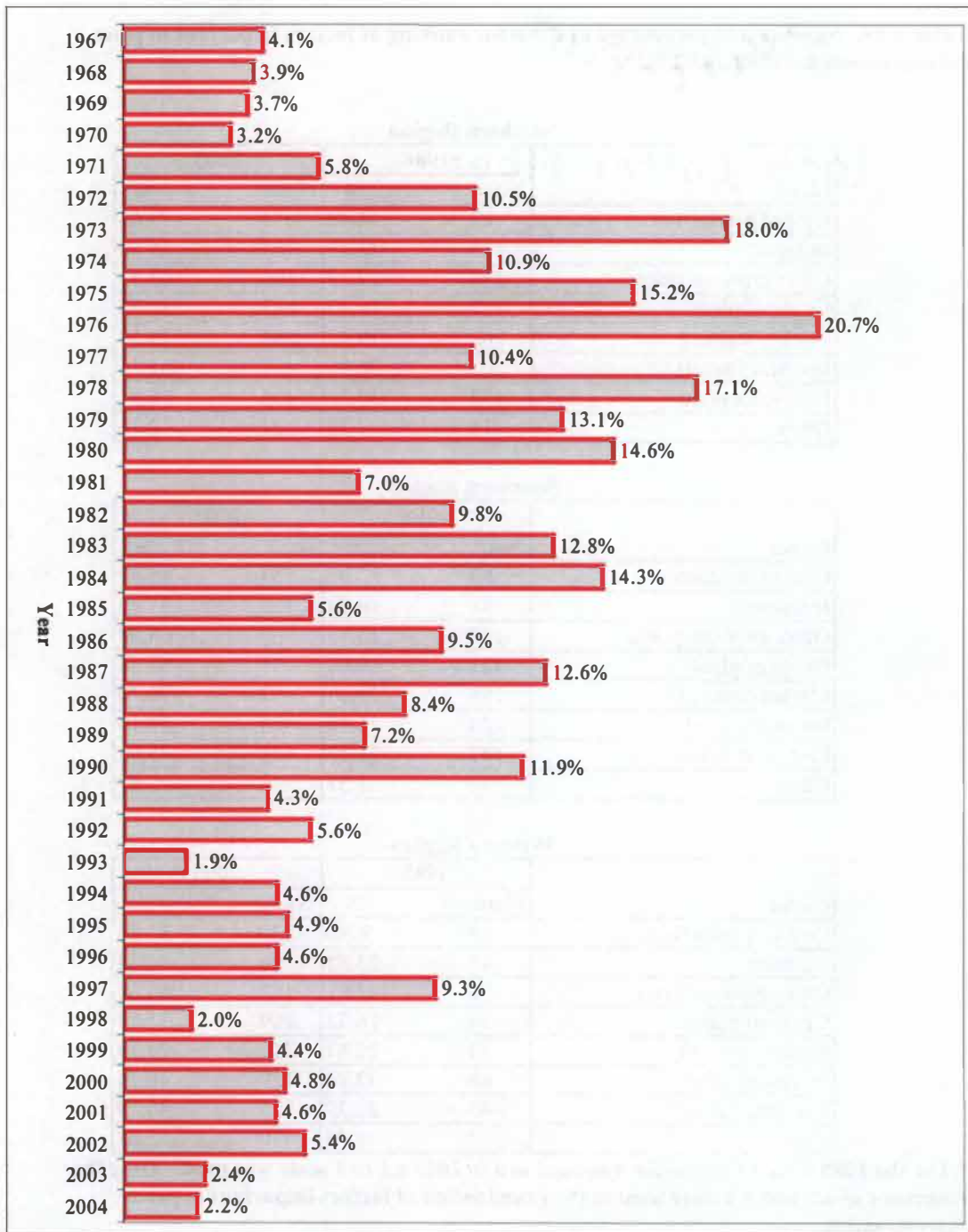
Southern Region

Factor	1988		2003	
	Num.	%	Num.	%
Cost of production	83	13.07	769	85.92
Inflation	91	14.33	286	31.96
Other growers' prices	147	23.15	587	65.59
Grade of plants	121	19.06	731	81.68
Market demand	188	29.61	682	76.20
Inventory levels	224	35.28	485	54.19
Last years price	147	23.15	403	45.03
Other	10	1.57	23	2.57

Western Region

Factor	1988		2003	
	Num.	%	Num.	%
Cost of production	18	8.96	230	83.33
Inflation	48	23.88	96	34.78
Other growers' prices	36	17.91	183	66.30
Grade of plants	34	16.92	209	75.72
Market demand	54	26.87	202	73.19
Inventory levels	66	32.84	129	46.74
Last years price	45	22.39	125	45.29
Other	7	3.48	10	3.62

* For the 1988 data a 1 to 5 scale was used and in 2003 a 1 to 4 scale was used. Only the responses of 4/5 and 3/4 were used in the examination of factors important to price determination.



Source: ERS 2005

Figure 1-1. Average annual percentage rate change in grower cash receipts from 1967 to 2004.

Vita

Bryan Frank Combs was born in Abingdon, VA on January 30, 1982. He was raised in Lebanon, VA and went to elementary, middle and high school at Lebanon. He graduated from Lebanon High School in 2000. From there, he went to Virginia Highlands Community College in Abingdon and received an A.A.S. in general studies in 2002. From there, he went to the University of Tennessee and received a B.S. in food science and technology in 2004 and a M.S. in agricultural economics with a minor in statistics in 2006.

The following information was obtained from the records of the
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