Regional Structural Change in Production and Marketing Practices for the Nursery and Greenhouse Industry: 1988–2003

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Abstract

The U.S. nursery and greenhouse industry has undergone major changes to production and marketing practices from 1988 to 2003. Using data from national surveys that have been partially funded by HR1, we examine the regional structural changes that have occurred during this period with emphasis on sales, advertising expenditures, and computer usage. Results indicate that a structural shift has occurred for several management decisions, with other decisions experiencing only regional shifts. Key results are that marketing and advertising expenses comprise an increasing percent of total sales, with advertising mediums experiencing varying levels of change. Transaction methods have experienced various types of changes with more in-person sales in the Northern region, less in-person sales in the Southern region, and no changes for the Western region. In contrast, telephone orders have decreased in the Northern region and increased in the Southern region, while all regions experienced lower trade show sales. There has also been a move away from wholesale toward retail sales, with repeat customers continuing to represent a large share of sales. Computer usage, as expected, has experienced a considerable increase due to every-day task usage.

Index words: green industry, greenhouse, marketing practices, nursery, structural change.

Significance to the Nursery Industry

Over the past two decades, there have been shifts in the structure, conduct, and performance of the nursery and greenhouse industry. Surveys have examined the present climate, but little has been done to understand what types of changes are taking place and whether or not the changes are regional in nature. Understanding the types of structural changes taking place and if they are localized allows both nurseries and greenhouses to better evaluate their managerial business decisions as compared to industry trends.

Introduction

The rapidly growing U.S. nursery and greenhouse industry (otherwise known as the ‘green’ industry) comprises an important part of the agricultural sector of the United States. Aggregate information detailing the size and scope of the U.S. nursery industry reveals that annual nursery crop sales have grown at an annual rate of 6.3% from 1989 to 2007, increasing from $7.8 billion in 1989 to $17.2 billion in 2007 (11, 13), with greenhouse and nursery crops accounting for the sixth largest value of farm cash receipts in 2007 (13). Thereby, per-household sales of nursery products has averaged approximately $139 over the last few years (7). Given current trends, the nursery and greenhouse industry can be classified as a mature market since rapid growth has transitioned into slower growth whereby nearly all potential buyers are already users of the industry’s products (5).

Although aggregate industry information is available, there is little information accessible comparing the business and marketing practices of firms within the industry. Considering 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. Therefore, the main goal of this study was to identify structural adjustments in the nursery industry that occurred during the 1988 to 2003 time period as indicated by regional changes in the use of information technologies (computer usage) and changes in marketing practices (trade show participation, repeat customers, sales transaction methods, wholesale/retail sales, wholesale categories, and advertising allocations).

Materials and Methods

In order to facilitate a better understanding of firm-level decision making within the nursery industry, the USDA S-103 (now S-1021) Multistate Research Committee has conducted four separate surveys (1989, 1993, 1998, and 2004) to obtain information on business, production, and marketing practices at the national level. Each of these studies was funded, in part, by the Horticulture Research Institute. For this study we utilized the 1989 and 2004 surveys to better understand whether business and marketing practices had changed over the last two decades.

The inaugural 1989 national survey provided in-depth questions regarding items from computer usage and types of sales to ways the firm did business during 1988. 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 limited the number of nurseries surveyed to those meeting minimum acreage requirements, a random sample of all nurseries, or a percentage of total production. A total of 23 states participated in the original survey representing a total of 1,504 respondents. Detailed analysis of the 1989 survey can be found in Brooker and Turner (3). A synopsis of their results

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indicated that telephone and person-to-person transactions were by and large the most frequent exchange method, on average 2.8% of sales were allocated to advertising, and a larger portion of advertising dollars for the nursery industry was used on catalogs and trade shows.

The most recent survey conducted in 2004 gathered data on decisions made in 2003 and included 44 states with 2,485 total respondents representing 93% of grower cash receipts. 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. Surveys were then targeted so as to sample 100% of large nurseries, 60 percent of the medium nurseries, and 25 percent of the small nurseries. In depth analysis of the 2004 survey can be found in Brooker et al. (2), while regional comparisons are in Behe et al. (1) and Hodges et al. (9). Main findings by Brooker et al. (2) were that entry of new firms into the nursery industry had increased since 2000; the major transaction methods used were again telephone orders and in-person orders; retail sales accounted for 19.6% of sales, while wholesale accounted for 80.4%, and the export market accounted for only a small portion of the total sales dollars at 1.8%; and over 60% of respondents in the states surveyed reported word processing as a use for computers in their firms.

Published analyses of each of the 1989 and 2004, as well as the 1993 and 1998, multistate committee surveys focused on survey descriptions of business and marketing practices. 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. Brooker, Turner and Hinson (4) compared changes in the 1994 and 1998 surveys and found that sales to repeat customers declined, advertising as a percent of sales at trade shows has showed little change. However, the questions that are of direct interest to this study are comparable. The question utilized to evaluate changes in industry terminology. Due to these modifications, some questions and/or response categories are unique to a particular survey description and cannot be used in time-series comparisons. However, the questions that are of direct interest to this study are comparable. The question utilized to evaluate changes within business operations was the use of computers for various functions (i.e., word processing, accounting, inventory, financial investing, and internet commerce).

Several questions relating to changes in marketing practices and sales were also analyzed, including: number of trade shows attended during the prior year; percentage of sales made to repeat customers; 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; and percentage of wholesale sales made to mass merchandisers, landscape firms and re-wholesalers.

To better understand structural changes occurring within the industry, respondents were divided into regions in order to determine if changes were regionalized. Survey responses were divided into the Southern, Northern, or Western region depending on the state the responding firm indicated as their home state (Table 1).

In order to compare responses for 1989 and 2004 for the various variables of interest, one of two methods was used. The method used depended upon the type of response given to the question. For questions with binary responses (i.e., yes, no), a t test was performed to determine if significant differences were present between the variable means for the two surveys. 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 (Tc) was calculated using equation 1 where \( \overline{X}_{1} \) and \( \overline{X}_{2} \) are sample means for 1988 and 2003, respectively, with \( i \) representing geographic grouping, and \( S_{i,p}^{p} \), equation 2, is the combined sample variances of the 1988 and 2003 data; assuming samples are statistically independent.

\[
Tc = \frac{\overline{X}_{1} - \overline{X}_{2}}{\sqrt{\frac{S_{1,p}^{p}}{n_{1} + n_{2}}}} \tag{1}
\]

\[
S_{i,p}^{p} = \frac{\sum_{i=1}^{n_{1}}(x_{i,1} - \overline{X}_{i})^{2} + \sum_{i=1}^{n_{2}}(x_{i,2} - \overline{X}_{i})^{2}}{(n_{1} - 1)(n_{2} - 1)} \tag{2}
\]

For questions with multiple responses, a chi square test of independence was performed. 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 are justification for rejection of the null hypotheses and acceptance of the alternatives.

\[
\chi^2 = \sum \frac{(f_{o} - f_{e})^2}{f_{e}} \tag{3}
\]

Table 1. Listing of states included in both the 1989 and 2003 national surveys of the nursery industry.

| Southern Region | Northern Region | Western Region |
|-----------------|-----------------|---------------|
| AR              | CT              | CA            |
| FL              | DE              | OR            |
| GA              | IL              | ME            |
| KY              | LA              | MI            |
| MS              | NC              | NY            |
| OK              | SC              | PA            |
| SC              | GA              | FL            |
| DE              | AR              | CT            |
| OK              | WI              | MI            |
| SC              | WA              | OR            |

*Only two states in the western region reported for both surveys. These two states accounted for approximately 24.1% of the total U.S. nursery sales for 2002 (12), while no state reported in both surveys for the eastern region.
The percentage of orders from trade shows has declined significantly for all three regions (Table 2). 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 more public relations activities to enhance relationships with customers. Since trade shows are not a primary sales venue, some growers have decreased the number of shows they attend; however, as noted below, there has been increased spending on advertising at trade shows. Decreased attendance and increased advertising seems to imply a more concerted effort to maximize visibility at shows that have the higher probability of leading to future sales allocating money to other advertising outlets. This is also shown in the data regarding percentage of sales transaction methods.

Further analysis of the percentage of sales by transaction method (Table 2) indicated that the Northern and Southern regions experienced significant changes in method type, most notably increases for in-person orders in the Northern region and increased telephone orders in the Southern regions, while the Western region had no significant changes. As noted above, these increases could be the result of the shifting emphasis of trade shows toward public relations, thereby, leading to future sales that occur via alternative sales methods.

The mean percentage of sales transactions with repeat customers has remained statistically unchanged for the Northern and Southern regions (Table 3). 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. Even though sales transactions with repeat customers have declined (not statistically for either the Northern or Southern region) for all regions over the period, repeat customer sales still remain an important part of nursery business accounting for about 70% of sales transactions.

### Table 2. Mean percentage of sales transaction methods for 1988 and 2003 as indicated by nursery and greenhouse grower respondents in the S-1021 national survey.

| Categories            | 2003 |                      | 1988 |                      | t value |
|-----------------------|------|----------------------|------|----------------------|---------|
|                       | N    | Mean     | STD Dev | N    | Mean     | STD Dev |         |
| **Northern Region**   |      |          |         |      |          |         |         |
| 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**   |      |          |         |      |          |         |         |
| 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**    |      |          |         |      |          |         |         |
| 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    |

*Significance levels are denoted: * = 0.1 significance level; ** = 0.05 significance level. A significant t test is justification for rejecting the null hypothesis that the means are not different between the two years.

### Table 3. Mean percentage of sales transactions with repeat customers for 1988 and 2003 as indicated by nursery and greenhouse grower respondents in the S-1021 national survey.

| Region         | 2003 |                      | 1988 |                      | t value |
|----------------|------|----------------------|------|----------------------|---------|
|                | N    | Mean     | STD Dev | N    | Mean     | STD Dev |         |
| **Northern Region** | 796  | 69.71    | 27.63   | 601  | 70.18    | 26.47   | −0.65*  |
| **Southern Region** | 895  | 73.79    | 27.59   | 635  | 75.01    | 24.15   | −1.81   |
| **Western Region** | 276  | 71.20    | 28.62   | 201  | 78.74    | 24.44   | −6.11*  |

*The 1989 and 2004 surveys collected data for 1988 and 2003, respectively.

**Results and Discussion**

*Results of the t tests.* The mean percentage of trade show orders have declined significantly for all three regions (Table 2). 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 more public relations activities to enhance relationships with customers. Since trade shows are not a primary sales venue, some growers have decreased the number of shows they attend; however, as noted below, there has been increased spending on advertising at trade shows. Decreased attendance and increased advertising seems to imply a more concerted effort to maximize visibility at shows that have the higher probability of leading to future sales allocating money to other advertising outlets. This is also shown in the data regarding percentage of sales transaction methods.

Significance at both the 0.05 and 0.01 level is denoted in the results tables. It is also important to note that differences in the 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%.
Table 4 indicates that the mean percentage of total sales attributed to wholesale outlets has declined significantly for all regions over the two decade time period, compared with the significant increase associated with retail percentage for all regions. Recent evidence has shown a division in growers in 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 (7). These firms are also showing signs of vertical coordination such as purchasing and/or marketing cooperatives (10). Examination of wholesalers’ sales to mass merchandisers, landscape firms, and re-wholesalers has declined over the period for all regions which correlates with the decline in wholesale transactions (Table 5).

Recent maturing of the nursery industry and more fierce competition has led to a greater focus on marketing and advertising efforts. Catalogs and trade shows are major marketing channels in the nursery industry, with catalogs among 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 (8). The mean percentage of total sales spent on advertising was statistically significant for all regions (Table 6). The major advertising changes across regions were the increased percentage of sales spent on radio/television advertising and at trade shows. Given the increased number of growers selling retail and the prevalence of radios and televisions within our society, this increase was expected, as was the increased advertising at trade shows given their importance as a marketing tool. Catalogs also experienced significant increases except for the Western region; however, the increases cannot be partitioned to increases from web versus printed formats.

Results of the Chi-Square tests. Computers can assist nursery businesses in managing large amounts of complex

| Categories          | 2003          | 1988          | t value |
|---------------------|---------------|---------------|---------|
|                     | N  | Mean | STD Dev | N  | Mean | STD Dev |
| Northern Region     |    |      |         |    |      |         |
| 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     |    |      |         |    |      |         |
| 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      |    |      |         |    |      |         |
| 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*  |

The 1989 and 2004 surveys collected data for 1988 and 2003, respectively.

Significance levels are denoted: * = 0.1 significance level; ** = 0.05 significance level. A significant t test is justification for rejecting the null hypothesis that the means are not different between the two years.

Table 5. Mean percentage of sales for wholesale categories for 1988 and 2003 as indicated by nursery and greenhouse grower respondents in the S-1021 national survey.†

| Categories          | 2003          | 1988          | t value |
|---------------------|---------------|---------------|---------|
|                     | N  | Mean | STD Dev | N  | Mean | STD Dev |
| Northern Region     |    |      |         |    |      |         |
| 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     |    |      |         |    |      |         |
| 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      |    |      |         |    |      |         |
| 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*  |

The 1989 and 2004 surveys collected data for 1988 and 2003, respectively.

Significance levels are denoted: * = 0.1 significance level; ** = 0.05 significance level. A significant t test is justification for rejecting the null hypothesis that the means are not different between the two years.
information and making daily operations run more efficiently (5). Given this, computer usage has increased for all regions evaluated over the two decade period. In 1988, nearly 44% of firms reported using computers for some function in their operation, while this increased to about 78% in 2003. Examination of the role of computerized information technologies across regions (Table 7) provides some interesting results. Each method of computer usage was classified as ‘currently in use’, ‘planned to be used’, or ‘neither planned or in use’. All regions show significant proportional changes in the use of computers for word processing with large increases in the ‘current’ usage. The use of computers for accounting functions demonstrated similar results across regions with increases in ‘currently in use’ and decreases in ‘planned’ and ‘neither planned/in use’. 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 all regions between 1988 and 2003. The Western region had the greatest proportion currently ‘in use’ at 29% followed by the Northern and Southern regions at 25.1 and 23%, respectively. The use of computers for internet commerce also increased for all 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% and the western at 33.0%. All computerized functions examined were statistically significant at the 5 percent level between 1988 and 2003 implying that the response patterns vary systematically by survey year.

There have been a number of changes in the ways the nursery and greenhouse industry conducted business in 1988 as compared with 2003. As seen by the changes in business practices over the time period in question, significant changes have occurred in sales transaction methods, sales to wholesale and retail outlets, allocation of advertising dollars and computerization.

Table 6. Mean percentage of total sales spent on advertising and allocation of advertising dollars for 1988 and 2003 as indicated by nursery and greenhouse grower respondents in the S-1021 national survey.

| Categories                        | 2003 | N | Mean | STD Dev | t value |
|-----------------------------------|------|---|------|---------|---------|
| Percentage of total sales         | 704  | 3.76 | 5.35 |         | 13.25*  |
| Allocation of adv. dollars        | 462  | 4,020 | 19,980 |         |         |
| Yellow pages                      | 580  | 1,414 | 4,256 |         |         |
| Radio/TV                          | 580  | 639  | 4,130 |         |         |
| Billboards                        | 580  | 373  | 3,761 |         |         |
| Catalogs                          | 580  | 5,145 | 26,309 |         |         |
| Trade journals                    | 580  | 3,292 | 26,507 |         |         |
| Newsletters                       | 580  | 2,418 | 11,111 |         |         |
| Trade shows                       | 580  | 3,523 | 21,368 |         |         |
| Other                             | 580  | 8,946 | 51,217 |         |         |
| Percentage of total sales         | 635  | 2.42 | 5.20 |         | 8.63*   |
| Allocation of adv. dollars        | 598  | 2,984 | 35,333 |         |         |
| Yellow pages                      | 598  | 104  | 833  |         | 6.63*   |
| Radio/TV                          | 598  | 74   | 862  |         | 2.40**  |
| Billboards                        | 598  | 3,444 | 14,847 |         |         |
| Catalogs                          | 598  | 1,886 | 8,774 |         | 5.87*   |
| Trade journals                    | 598  | 1,784 | 12,994 |         |         |
| Newsletters                       | 598  | 6,076 | 26,292 |         |         |
| Trade shows                       | 598  | 5,265 | 53,764 |         |         |
| Other                             | 598  | 5,265 | 53,764 |         |         |

zThe 1989 and 2004 surveys collected data for 1988 and 2003, respectively.

xSignificance levels are denoted: * = 0.1 significance level; ** = 0.05 significance level. A significant t test is justification for rejecting the null hypothesis that the means are not different between the two years.

Values expressed in 2003 dollars (GDP Implicit Price Deflator, U.S. Department of Commerce).
industry has recognized the need to focus on concentrated efforts to keep repeat customers through more ‘traditional’ advertising efforts.

Given the changes taking place within the industry, it is interesting that not all regions have evolved in the same manner. The transaction methods within the Northern region have experienced an increase in in-person sales with a reduction in sales via telephone, whereas the Southern region shows an increase in telephone sales with decreased in-person sales. Other interesting differences can be seen by comparing the magnitudes associated with each region’s percentage of sales from retail and wholesale. Even though wholesale sales as a percentage of total sales have decreased over the past two decades for all regions, the Southern and Western regions utilize wholesale sales to a higher degree than the Northern region.

Finally, as expected, computer usage has increased for a variety of tasks, including: word processing, accounting, inventory control, financial investments, and internet commerce. Those businesses failing to adopt these technologies are most likely experiencing considerable losses in efficiency given the decreased amount of labor hours needed if computer technologies are utilized. These losses in efficiency could translate into increased costs and thereby less profitability.

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