

# **Economics**

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## Multistate Survey of Nursery Laborer Level Employees: A Complex Survey Analysis

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**Index Words:** nursery workers, Hispanics, survey

### **Significance to the industry:**

The greenhouse and nursery industry is the fifth most important agricultural sector in the United States in terms of sales (8). In OH, MI, DE, TN, FL, IN, KY, AZ and RI, the nursery industry contributes a total of \$598 millions annually in employee payroll and generates jobs for 29,254 full-time workers (9). Demographics of the nursery industry workforce in the United States have changed dramatically in the past 10 to 15 years. This survey targeted the workforce of the U.S. nursery industry. Previous workforce surveys had not been conducted. Seventy two percent of the survey respondents were general laborers, 14.3% crew leaders and 12.7% were classified as "others". Average over the nine states 70% of the nursery industry workforce is composed by Hispanics. The majority of this population is Mexican (57%).

### **Nature of work:**

The objective of this project was to determine the backgrounds in terms of nationality, the years of experience, importance of legal status, technical information interests, work activities and current technical information resources available to nursery workers in nine states, MI, DE, TN, FL, IN, KY, AZ and RI. A Self Administered Questionnaire (SAQ) was written to limit bias and considering the project objective and target population of nursery workers in the nine states indicated above. The SAQ had two versions: Spanish and English and contained 31 questions. The nine states interested in participating in the survey were identified at the spring meeting of The Green Industry Research Consortium S-1021 committee (7). In each participating state a researcher was assigned to obtain the cooperation from nurseries in that state.

Permission to collect data from the nursery workers, using an anonymous, voluntary, mailed survey was obtained by the Ohio State University (OSU) Institutional Review Board (IRB) in August 2005. The primary sampling unit was the nursery (cluster). The clusters were stratified by state where the observation unit was the nursery worker. A stratified clustered random sample of 40 nurseries, 20 medium and 20 large, in each state was drawn from Hall et.al. (2), "U.S. Nursery Directory". The list of 40 nurseries was sent by e-mail to the

researcher in each state. The state researcher telephoned using a script, each of the 40 nurseries until 30 nurseries, 15 medium and 15 large, per state agreed to participate. In some states stratified clustered random samples had to be pulled several times before 30 nurseries were confirmed.

A survey package containing surveys in English and Spanish and a business reply envelope or label was sent from OSU Columbus, Ohio to each of the confirmed participating nurseries during the Summer 2006. No incentives to complete the surveys were provided. A reminder letter was sent to the nurseries if no response had been received by September 2006.

In this study the population of nurseries was divided into nine subpopulations, representing each state. The states did not overlap, and constituted the whole population therefore each sampling unit belonged exactly to one stratum (3) or one nursery was located in only one state. Data entry was conducted using SPSS® (6) version and analyzed using SAS® version 9.1 (5) for windows. This program computes the variance estimates based on a complex multistage survey design with stratification, clustering, and unequal weighting (5). Sampling weights are important to deal with the effects of stratification and clustering on point estimates. In each state the worker weight was calculated by dividing the total number of nurseries by the number of participating nurseries. The method chosen for correcting no-response items was imputation. Imputation is commonly used to assign values to missing items such as questions the respondent did not answer on the questionnaire (3).

### **Results and Discussion:**

A total of 1548 surveys were returned of 4466 surveys sent for a 34% response rate. Seventy five percent of returned surveys were Spanish versions and 25% English. Response rate by state varied from 13.4% in Tennessee to 51.0% in Michigan. Seventy two percent of the survey respondents were general laborers, 14.3% crew leaders and 12.7% were classified as "others". The primary language spoken at work by survey respondents was Spanish (63%) followed by English (30.3%). Only 5.6 percent of the workers indicated ability to speak both languages.

Using the definition of Hispanics proposed by Nieto-Montenegro et.al. (4), an analysis of frequencies by state of the proportion of workers who were Hispanics was performed (Table 1) Average, over the nine states, 70% of the nursery industry workforce is composed of Hispanics. The majority of this population is Mexican (57%). This data corresponds with the U.S. Department of Labor (10) which states 75% of agricultural workers are Mexican.

For this survey 48.2% of respondents were women and 51.3% men. The high proportion of women is primarily due to the high percentage of women in Florida. Florida has 45% of the total women; in addition this state constitutes 20% of the total number of nurseries in the United States.

The Rao-Scott chi-square test between job position and ability to speak, understand and read English indicated a significant association between job position and English skills. Workers with high English proficiency held advanced jobs. 77.5% of the workers considered having a legal status to work in the U.S as “very important”, only 3% considered legal status “not important”.

To better understand the nursery workers’ job environment, we asked respondents to rank ten potential work issues. Figure 1 shows the percentages of responses and standard errors. Job accidents, low salary, poor work conditions, bad relationship with your supervisor and lack of benefits were work issues that 60% or more of the respondents considered very important. Low salary ranked highest of these five issues with almost 70% of respondents indicating this would improve their job environment. Table 2 indicates 45% of the nursery workers were paid between \$6.00 to \$7.99 per hour. The Bureau of Labor Statistics (1) reported the average hourly earnings of non-supervisory workers during 2007 in the U.S. were \$17.16. Seventy seven percent of the nurseries workers are receiving less than the reported U.S. average hourly earnings, this percentage is coinciding with the 72% of Hispanics working in the industry.

Seventy percent of respondents indicated they lacked health benefits and 39% indicated they lacked workers compensation benefits. Sixty percent of the nursery workers have not received training courses related to their work. Only 8% indicated having access to courses (Figure 2). Seventy seven percent of the workers were interested in attending worked related course or class. The most preferred topics for potential classes were English/Spanish, plant identification, plant disease identification and control and equipment safety. The resources to nursery workers were co-workers (75.6%) and supervisor (69.4%), 15% books, only 10% indicated access to Internet and again courses were the least available resource (Figure 2)

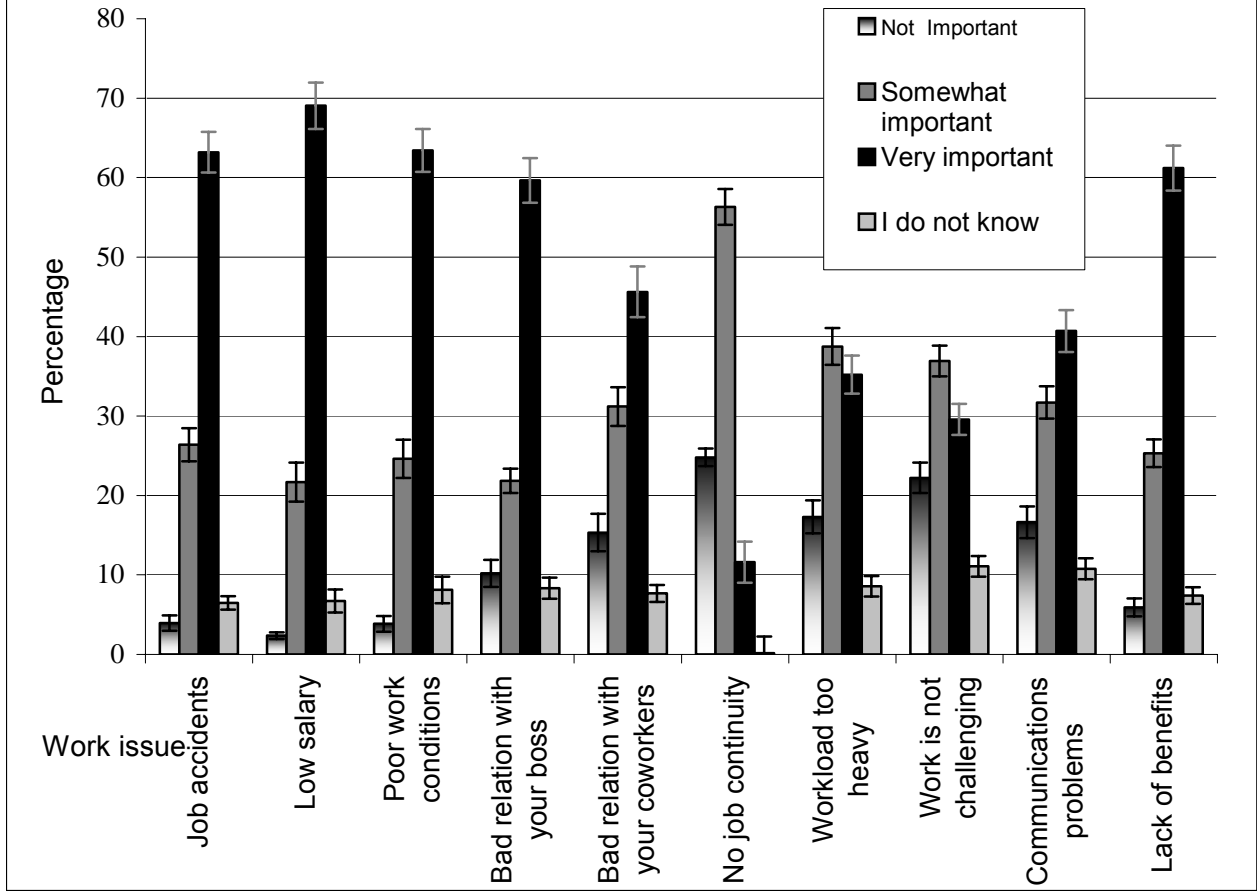
Table 1. Survey responses from nine states and 1548 surveys indicating the percentage of Hispanic nursery workers by state, percentages based on survey design and weights referenced by state.

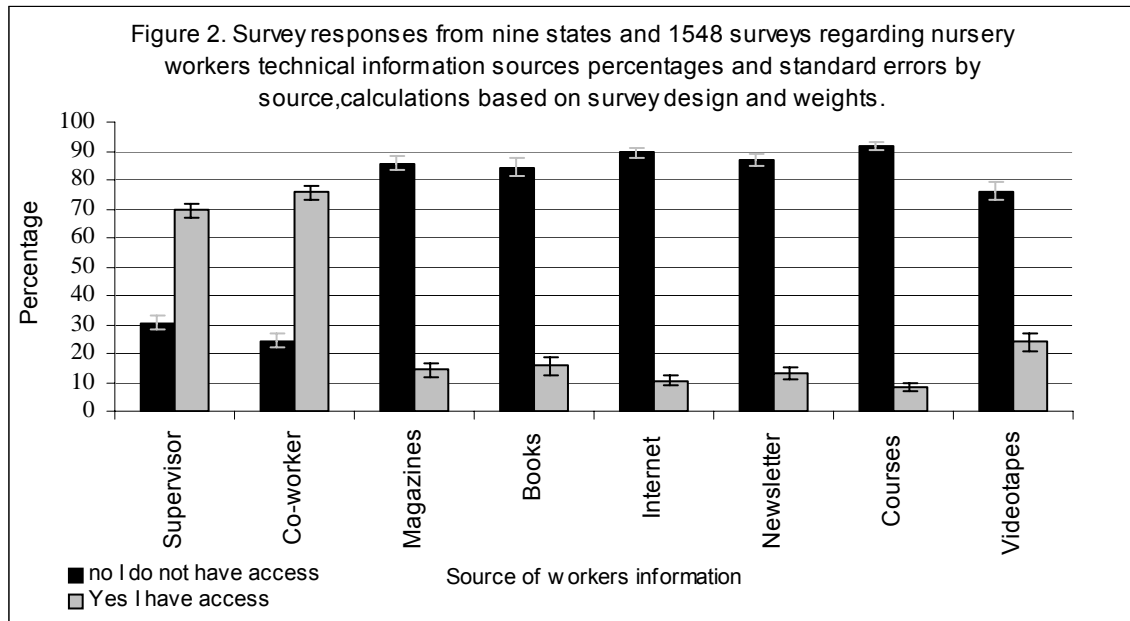
State	Percentage of Hispanics
AZ	96.0
DE	88.5
RI	88.2
MI	82.4
OH	71.9
FL	67.6
TN	66.6
KY	57.6
IN	17.9

Table 2. Survey responses from nine states and 1548 surveys regarding nursery workers hourly earnings, percentages and 95% confidence interval calculations based on survey design and weights.

Hourly wage	Percentage	95% confidence interval for the percentage	
Less than \$6.00 per hour	2.4	0.6	4.2
\$6.00 to \$7.99 per hour	45.0	36.3	53.7
\$8.00 to \$9.99 per hour	32.7	27.2	38.2
More than \$10.00 per hour	19.9	14.9	24.9

Figure 1. Survey responses from nine states and 1548 surveys indicating nursery workers work issues, percentages and standard errors by issue, calculations based on survey design and weights.





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## Comparison of Nursery Crop Production and Technical Advisement in the UK and USA.

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**Index Words:** nursery statistics, United Kingdom, Cooperative Extension, consulting

**Significance to Industry:** Nursery crop production is a significant component of the agricultural economy in the United Kingdom (UK), but is considerably smaller than that of the USA. In the UK, nursery crop producers cannot rely upon independent, University-based sources of research and information such as the Cooperative Extension Service. Larger growers pay consultants for individual technical advice, but smaller growers must rely upon other sources of information such as sales representatives, trade publications, levy funded research papers, or peers. The impacts of such systems on nursery businesses in these systems has not been fully studied but it appears clear that smaller growers are at a disadvantage for receiving the latest research-based information when a government-sponsored educational outreach program such as Cooperative Extension is unavailable.

**Nature of Work:** Nursery crop production has become a global business. Container nursery crop production systems and challenges can be remarkably similar in different countries (7). However, how growers respond to production challenges and problems will depend upon access to information. In the US, nurseries have access to a wide array of information sources including government-sponsored programs (such as Cooperative Extension), yet growers in other countries do not benefit from such programs. In this paper we describe similarities and differences between nursery crop production in the US and the UK.

**Results and Discussion:** Within the European Union (EU) the United Kingdom represents 7% of the wholesale market for plant and flower production (4). Hardy nursery stock in 2005 was worth a total value of \$915 million (=£452 million) and represented about 17% of UK wholesale crop value (2, 3); compared to \$3.79 billion for US nursery crop production (9). Nursery crop values in the UK were remarkably similar to the values of nursery crop production in North Carolina where wholesale crop value for the greenhouse / nursery sector was \$872 million, representing 34% of NC crop revenues (8). Unlike other agricultural sectors, nursery crop producers in the UK receive no government subsidies or European Union (EU) funding (4). The size of nurseries in the UK is generally smaller than in the US with over 50% of horticultural holdings in the UK less than 2.5 acres in size (6). The average size for US nurseries in the same year was about 59 acres (9).



In the US, nursery crop producers have many sources of information including the Cooperative Extension Service. In the UK, before 1987 a similar free advisory service was available from a division of the Ministry of Agriculture, Fisheries and Food. However, in 1987, advisory services became chargeable; then in 1997 the consulting services were privatized. Companies and a few independent advisors provide consulting services for about \$121 to \$142 (~ £60-£70) per hour. For many smaller growers these fees are too expensive; they therefore tend to seek alternative forms of information such as trade press, levy funded research publications, salespersons and peers. Advisors receive their information through current research, coordinated by the Horticultural Development Council (HDC), attending conferences and visits to continental Europe. In order to provide advice on pesticides, advisors must be registered with BASIS Registration Ltd., an independent registration, standards and certification scheme.

The HDC collects a levy from growers -- 0.5% of the annual gross revenues for businesses with sales of > \$101,000 (~£50,000). Smaller growers may participate for a set fee of \$253 (~£125) per year. This money is used to fund research, trade shows and educational programs. The HDC also publishes fact sheets, training DVDs and a monthly journal which are sent to members (5). In addition, the HDC provides some technical visits that are usually free of charge. Most of the money collected from levy and membership dues funds near-market applied research such as: herbicide evaluations, disease control, methods of scheduling irrigation, nutritional studies, integrated pest management, and crop scheduling. The three main contractors of research are Warwick Univ. Horticultural Research Institute, East Malling Research and ADAS (5). The UK government also funds some research. Most of this research is not angled towards near-term industry needs but rather is aimed at environmental issues such as reducing chemical use, biocontrol of pests, saving water and a reduction in global warming. In the US, the Horticultural Research Institute (HRI) funds research on nursery crops production practices. The sources of HRI funding are an annual membership fee of \$200 per firm and contributions to the HRI endowment fund, both of which are voluntary (1).

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## On-line Gardening Search Activities and Purchases

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**Index words:** consumer, survey

**Significance to the nursery industry:** Many businesses today have an Internet presence and some sell products on-line because most homes have personal computers and Internet access. While Internet search and purchase information is readily available for other industries, not much is known about the Internet search and purchases for gardening-related products. A survey of 1588 U.S. consumers showed that nearly 90% of the participants had searched on-line for some type of information in the year prior to the survey, and 27.4% had searched for garden-related information. While 49.4% had made an internet purchase of some item, 52.6% had made a garden-related purchase in person and 7.4% had made a garden-related purchase on line. The demographic profile of respondents who searched for garden-related information was similar to the typical American gardener, but searchers were slightly younger and from slightly less-affluent households. Participants who made garden-related purchases on-line were demographically similar to those who purchased in-person. Horticultural firms should strongly consider adapting part of their marketing strategy to include an on-line presence, for now primarily as an information source for their customers, and especially to connect with younger gardeners.

### **Nature of Work:**

Since 1993, the U.S. population has rapidly adopted Internet technology. According to the U.S. Census Bureau, a majority of households (62%) had personal computers in 2003 (5). Approximately 89% of households with personal computers also had Internet access. There was a 10.8% increase in home computer ownership and a 13.2% increase home Internet access from 2000 to 2003 (5). Increased access to the web has led to more consumer goods and services being marketed and purchased online.

Electronic commerce or e-commerce, defined as “any form of economic activity conducted via electronic connections” between businesses and consumers has grown substantially since the inception of the Internet (8). According to Infoplease, online retail spending in 2004 reached approximately \$66 billion (6). Forrester Research (5) projected that two-thirds of the U.S. population will shop online and spend approximately \$217.8 billion online in 2007.

Most American gardeners are Caucasian homeowners who are > 40 years of age, and from slightly more affluent households, with an average income > the median U.S. household income of \$43,000 (1,2,4) and the percentage of older Americans who participate in gardening activities is higher than younger Americans (4). Seven million households (8%) purchased gardening-related products or plants from mail-order catalogs or on-line (combined), up from six million households (7%) in 2003 (3). In 2000, \$100 million (0.41% of total retail spending online) was spent on the purchase of gardening supplies online. This increased to \$700 million (0.87% of spending online) in 2005 (7). Although plants and related gardening supplies do not account for a large portion of online sales, the purchase of these items online has increased steadily over the past several years. Growth in online spending on gardening supplies raises several questions about the consumers purchasing these items. Are on-line searchers and purchasers of gardening-related products different from in-person purchases with regard to certain demographic characteristics?

A better understanding of the Internet gardening searches and purchases could benefit retailers and others in horticultural product distribution channels. The objective of this paper was to characterize individuals who made garden-related on-line searches or purchases. By knowing the demographic characteristics of consumers who search and/or shop on-line, businesses that sell gardening related products and services would be able to more effectively market products to them.

#### **Materials and Methods:**

In September 2004, an Internet survey was conducted by Knowledge Networks (California) to determine the gardening participation and purchases of a representative sample of Americans. They drew a sample representative of the U.S. population on average ( $\pm 1\%$ ), but over-sampled for three ethnic groups: African-Americans, Hispanics, and Asians. Responses totaled 1610, of which 1588 were complete and used in analyses.

Respondents were asked about Internet searches for information on specific topics, including gardening. They were also asked about their gardening-related purchases, both in-person and on-line. The survey instrument was approved by the university committee on research involving human subjects and then pre-tested using 50 subjects from the Knowledge Networks panel. Data were collected between 3 September and 20 September, 2004. If a participant needed computer or Internet access, Knowledge Networks provided it free of charge. Statistical tests were conducted with SPSS 13.0 (Chicago, IL).

#### **Results and Discussion:**

##### *Internet Search*

Only 12.3% of the sample had never searched for any type of information on-line in the year prior to the survey. Respondents searched an average of 3.7 times in the previous year, but 50.2% searched for information at least weekly, and 17.8% searched daily. Three times the percentage of respondents aged 18 to 29 years searched for any type of information on-line daily (27.9%) as compared to

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respondents  $\geq$  age 60 years (8.5%) ( $\chi^2 = 104.396$ ,  $p=0.000$ ). Nearly twice the percentage of single respondents searched for information on-line daily (28.6%) compared to married respondents (15.2%) ( $\chi^2 = 72.984$ ,  $p=0.000$ ). More than twice the percentage of households with income  $\geq$  \$100,000 searched for information on-line daily (27.5%) compared to respondents with household income  $<$  \$25,000 (11.9%) ( $\chi^2 = 68.196$ ,  $p=0.000$ ). Nearly half of the Caucasian respondents (49.5%) searched for information daily, compared to nearly one-quarter (24.2%) of Asians and only 13.5% of Hispanics and 12.8% of African-Americans ( $\chi^2 = 45.539$ ,  $p=0.000$ ). There were no differences in the percentage of respondents who searched online daily by region of residence ( $\chi^2 = 10.730$ ,  $p=0.295$ ), and gender ( $\chi^2 = 0.986$ ,  $p=0.805$ ). Younger, more affluent individuals from many regions of the U.S. searched for many types of information on-line on a daily basis. A smaller percentage of minority participants searched frequently for information.

#### *Garden-related search*

There were 432 respondents (27.4%) who searched for gardening information. A higher percentage of respondents with a detached residence (79.6%) had searched for garden-related information than those with an attached residence (20.4%) ( $\chi^2 = 22.693$ ,  $p=0.000$ ). Surprisingly, more moderate income households (\$25,000 to \$49,999) searched for garden-related information (32.4%) compared to higher-income households (\$50,000 to \$74,999 with 27.6% or  $\geq$  \$75,000 with 17.6%) or lower-income households ( $\leq$  \$25,000 with 22.4%) ( $\chi^2 = 11.466$ ,  $p=0.010$ ). A higher percentage of respondents aged 30-44 years (34.6%) and 45-59 (30.8%) searched for gardening information compared to participants  $\geq$  age 60 (18.3%) and ages 18 to 29 years (16.3%) ( $\chi^2 = 8.288$ ,  $p=0.040$ ). A higher percentage of Caucasian respondents (57.5%) searched for gardening information compared to African-American (10.8%), Hispanic (14.5%), or Asian (17.2%) participants ( $\chi^2 = 20.111$ ,  $p=0.000$ ). A higher percentage of individuals with a higher level of education searched for garden-related information on-line ( $\chi^2 = 31.319$ ,  $p=0.000$ ). Married respondents were slightly more likely to have searched for gardening information (61.8%) compared to single respondents (22.9%) ( $\chi^2 = 12.511$ ,  $p=0.014$ ). More homeowners (71.7%) than renters (24.2%) searched for garden-related information. There was no difference in the percentage of respondents who searched for gardening information by region of residence ( $\chi^2 = 6.009$ ,  $p=0.111$ ), work status (working or retired ( $\chi^2 = 2.017$ ,  $p=0.090$ )) or gender ( $\chi^2 = 2.240$ ,  $p=0.075$ ). Searchers for garden-related information were different from the general U.S. population in that they were more often homeowners with a detached residence, from a moderate income and moderately-aged Caucasian households. This profile is similar in many ways to that of the typically American gardener (1,2,4), except for age and income. Searchers of garden-related information were younger and slightly less affluent than typical gardeners.

#### *Internet Purchases*

There were 776 respondents (49.4%) who had made an on-line purchase of any type of product in the year prior to the survey. A higher percentage of respondents from households with income  $>$  \$100,000 made online purchases (27.8%) compared

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to only 16.1% of respondents from households with income < \$25,000 ( $\chi^2 = 109.316$ ,  $p=0.000$ ). A higher percentage of respondents from the Southern U.S. (33.2%) bought items online compared to respondents from the Midwest (15.6%), Northeast (20.2%) or West (31.0%) ( $\chi^2 = 24.489$ ,  $p=0.000$ ). A higher percentage of respondents ages 30-44 years (37.1%) made online purchases, compared to persons aged 18-29 years (24.1%), 45-59 years (26.3%), and  $\geq 60$  years (12.6%) ( $\chi^2 = 74.319$ ,  $p=0.000$ ). A higher percentage of Caucasian respondents (55.0%) made online purchases compared to African-American (12.9%), Hispanic (14.0%), and Asian (18.1%) ( $\chi^2 = 39.290$ ,  $p=0.000$ ). There was no difference by gender ( $\chi^2 = 0.085$ ,  $p=0.800$ ). So, more affluent Caucasians made on-line purchases of many types, with a slightly higher percentage of Southerners making them.

#### *Garden-related Internet purchases*

Nearly 53% of the participants made a garden-related purchase in-person while 7.4% (115) made a gardening-related purchase on-line. Of the 851 respondents who had made a garden-related purchase either in-person or on-line, 8.2% (69) respondents had made a gardening-related purchase from both venues and only one respondent had made a garden-related purchase exclusively on-line ( $\chi^2 = 23.513$ ,  $p=0.000$ ). Most participants made on-line garden related purchases to supplement garden-related purchase made in person.

The average number of garden-related purchases from in-store retailers (3.47) was > eight times higher than the average number of gardening purchases from online retailers (0.40,  $t = -14.94$ ,  $p < .001$ ). The average number of gardening purchases made by other adults in the household from in-store retailers (2.97) was nearly 12 times higher than gardening purchases from online retailers (0.25,  $t = -13.53$ ,  $p < 0.001$ ). Gardening purchases for the household are still predominantly made in person, not online.

In comparing the demographic characteristics of those who made purchases in-person with those who had made purchases on-line, we found no difference in age ( $\chi^2 = 7.303$ ,  $p=0.063$ ), education ( $\chi^2 = 3.269$ ,  $p=0.352$ ), ethnicity ( $\chi^2 = 5.243$ ,  $p=0.155$ ), gender ( $\chi^2 = 0.885$ ,  $p=0.222$ ), homeownership ( $\chi^2 = 4.873$ ,  $p=0.087$ ) income ( $\chi^2 = 0.307$ ,  $p=0.959$ ), region of residence ( $\chi^2 = 5.045$ ,  $p=0.169$ ), residence type (attached or detached) ( $\chi^2 = 1.57$ ,  $p=0.147$ ), or work status (working or retired) ( $\chi^2 = 1.064$ ,  $p=0.224$ ). Demographically, gardener who bought a gardening item on-line was similar to the gardener who purchased in-person.

Among the garden-related items that were purchased on-line were both plant and non-plant items. Among the plants, 2.5% purchased annual or perennial plants, 1.5% purchased a tree or shrub, and 0.8% purchased an herb or vegetable. Another 2.2% purchased bulbs and 2.2% purchased seeds. In the non-plant items, 0.6% purchased a composter or composting device, 0.3% purchased fertilizer, 1.4% purchases a non-motorized tool, 0.9% purchased a motorized tool, 0.7% purchased weed control, 0.7% purchased garden furniture, and 0.9% purchased garden art. Surprisingly, plants, seeds, and bulbs were among the most widely purchased garden-related products.

**Conclusions:**

Results from this study indicate that gardening purchases are still predominantly made in person, not online. However, with the prevalence of computers and Internet access at home, strong consideration should be given to developing an Internet presence for the horticultural business. Some gardeners appear to be supplementing their in-person purchases with on-line purchases; the two groups were similar demographically. While the demographic profile of on-line purchasers was similar to in-store purchasers, searchers for information on gardening topics were younger and slightly less affluent than the typical American gardener.

Purchases were made of both plant and non-plant items, but plant purchases surpassed non-plant purchases. Information about plants should be a key component of any horticultural website. Having knowledge and understanding of the online search and purchase behavior of consumers who use the Internet can assist gardening retailers in producing the most effective marketing campaigns and company websites. Using the data provided by this study, gardening retailers should be able to more successfully target potential consumers.

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## Marketing How to Deal with Rising Energy Costs in Greenhouses

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**Index Words:** Fuel cost, partial budget, floriculture, profit

### **Significance to Industry:**

All types of energy have increased in the last few years (Table 1). In a mature market with intense competition, this is a concern for many greenhouse operators.

### **Nature of Work:**

In a survey of 30 greenhouse businesses, energy costs averaged 8.5% of sales (Table 2). This includes heating fuel, gas/diesel, electricity, and trucking costs. To deal with high energy costs in their greenhouse producers can:

- + Reduce fuel costs.
- + Conserve energy.
- + Evaluate alternative or additional fuel sources or heating systems.
- + Change production practices.
- + Use space wisely.
- + Evaluate costs to look for places to cut.
- + Increase prices.

The following is a checklist of the options to consider.

### **Reduce Fuel Costs**

- + Select the cheapest fuel supplier.
- + Switch to a different fuel.
- + Use a dual fuel system.
- + Buy in off season.
- + Consider buying on the spot market, a possible 20% savings.

### **Conserve Energy**

- + **Electricity**
  - o Inspect wiring.
  - o Replace inefficient motors.
  - o Low wattage fluorescent bulbs save 66% vs. incandescent bulbs.
- + **Trucks**
  - o Regular tune-ups save 10% on fuel.
  - o Avoid lengthy idling and save 15-20% on fuel.
  - o Run at the proper gear.
  - o Consider hiring trucks or having the customers pick-up products.



 **Watering Systems**

- Locate hot water tanks near most frequent use.
- Heat to 120 degrees.
- Eliminate leaks.

 **Greenhouse Structure**

- Consider **newer structures** which have tight seals.
- Use **double polyethylene** coverings to reduce heating costs by 50% over single poly.
- **Retrofit.** A single layer of film over glass reduces heating costs by 5% to 50% but reduces light transmission.
- **Winterize openings** to reduce heating costs.
- **Reduce Air Leaks**
  - Caulk and weather strip door frames, windows, and other openings.
  - Lubricate louvers.
  - Keep vents in good working condition so that they close tightly.
  - Seal all cracks in walls
  - Repair any holes in the plastic, glass, or doors.
  - Keep doors closed.
- **Maximize the Insulation - Use highest R-value for insulation.**
  - Insulate endwalls, foundations, and side walls.
  - Add windbreaks outside the greenhouse along the north wall.
  - Insulate secondary fans and vents.
- **Add a Thermal Blanket** - Up to 85% of the heat loss from a greenhouse occurs at night. An energy/shade curtain can reduce energy consumption by 20% to 50%. A porous curtain material prevents condensation from pooling above the plants. Open the curtain open during snowstorms to allow the heat to reach the roof to prevent snow accumulation.

 **Efficient Heating System** - Maintaining maximum efficiency.

- Under bench heat allows temp to be set 5-10 degrees lower.
  - Check accuracy of thermostats.
  - **Aspirate thermostats** near the plant canopy to save 2% to 3% .
  - **Solid-state electronic thermostats** reduce the differential between the on and off modes to 1°F instead of the 3°F to 4°F of mechanical thermostats.
  - **Calibrate sensors** to avoid chilling damage to the crop.
  - Perform **annual maintenance**.
  - Periodically check system performance to insure that the boiler, burner and backup systems are operating in peak efficiency.
  - Periodically check operation of mixing valves.
  - Use the proper fuel for the system for maximum efficiency.
  - **Insulate** boiler or distribution pipes in areas where heat is not needed.
  - Install an air inlet pipe for direct fired heaters to provide fresh air for combustion from outside the greenhouse.
-

✚ **Add Horizontal Air Flow (HAF) Fans** for uniform temperature & humidity.

✚ **Efficient Cooling System.**

- Build open-roof greenhouse.
- Install roll up sides.
- Shade.
- Install evaporative cooling.
- Keep doors closed when fans are on.

**Alternative Heating Fuels and Heating Systems.** Consider changing your primary heating system, especially if you have an older system. Evaluate the efficiencies, investment costs, and operating costs of a new system.

- ✚ Solar (hot water heating).
- ✚ Other solid biomass (corn).
- ✚ Biodiesel.
- ✚ Waste oil (fast food industry).
- ✚ Waste gas (landfill/co-generation).
- ✚ Geothermal (hot water/steam).
- ✚ Wood (waste wood/firewood).
- ✚ Hot water boilers - Modular, low-mass, energy efficient hot water boilers.
- ✚ Hot water unit heaters.
- ✚ Infrared radiant systems warm plants, people, and surfaces without heating the air and save up to 30% fuel over forced-air unit heaters.

**Change Production Practices**

- ✚ Lower night temps reduce fuel 3% per degree; but delays crops 11% to 13%.
- ✚ Grow cool season crops, but make sure you have a market for them.

**Utilize Space Wisely**

- ✚ **Compartmentalize.** Group plants according to temperature tolerances so that some houses are run cooler than others.
- ✚ **Zone for higher temperatures** - Consider adding higher efficiency bench or floor heating systems in root zones of areas that require higher temperatures, such as propagation or seedling and plug production areas.
- ✚ Maximize the use of heated greenhouse space. Keep growing areas full, and don't bring the next greenhouse on-line until absolutely necessary.
- ✚ Consider peninsular or movable benches; they use 80-90% of space.
- ✚ Use roll out benches.
- ✚ Install multi-level racks for low light level crops.
- ✚ Put hanging baskets over benches.
- ✚ Plan the spring production schedule carefully.

**Analyze Costs**

- ✚ Know your costs of production to determine the financial impact of changes. You can develop your own enterprise budget using pen and paper or use a spreadsheet. A free on-line greenhouse cost accounting spreadsheet is

available at <http://aesop.rutgers.edu/~farmmgmt>. An Excel version is available \$50.

- ✚ Always compare apples to apples. For example, compare all fuel sources on a cost per heating equivalent, e.g., dollars per million Btu's (\$/MBtu), and alternative crops on an equivalent return for time and space e.g., returns per square-foot week.
- ✚ **Consider dependability and sustainability of alternatives.** For example, make sure that sufficient quantities of an acceptable quality fuel will be available when needed. If you are considering cool season crops, make sure you have a dependable market for those crops.
- ✚ **Include conversion and operating costs** - For example, coal and wood-fired boilers or furnaces require additional labor to operate, and the waste product (ashes) will need to be disposed.

Let's do a partial budgeting analysis of lowering night temperature by 4 degrees. Reducing greenhouse night temperature by 4 degrees reduces fuel consumption, and thus fuel cost by 12% (3% per degree), but delays crops by 11% (Table 3). Let's assume that delaying crops by 11% means that 11% fewer crops can be produced, and thus revenue will be 11% lower, resulting in a net loss of \$219,836. This energy saving alternative (lowering night temperature) creates other problems (delaying crops) and results in a net loss.

### **Increase prices**

In 2003, energy costs were 8.2% of sales in greenhouses in the Northeast. If everything else is held constant and energy components are inflated based on U.S. Department of Energy data, energy becomes 11.8% of sales and profit margins drop from 9.4% to 5.9% of sales. One way to recover these costs is to increase prices. An increase of only 5% more than recovers all of the costs and brings profits back up to 10.3%. One way to increase costs is to add a fuel surcharge. Consumers are facing their own increased energy costs for gasoline and heating, and thus understand that your costs have increased.

### **Summary**

Profits may not be the only objective of the business. Some questions to ask are:

- ✚ Which alternative enables me to reach my objectives?
- ✚ Which alternative best matches my firms skills & resources (financial, technical, personnel, etc.)?
- ✚ Which alternative best meets my preferences or sense of social responsibility?
- ✚ Which alternative minimizes the creation of new problems?
- ✚ How will each alternative affect my current activities?
- ✚ How much time will be required to incorporate each alternative?

Don't forget to include the employees in the planning and evaluation process. They are often closer to problems than owners/managers and can contribute to recommendations and solutions to problems. Knowing that their opinion is valued also can improve their job satisfaction and productivity.

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**Additional References**

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- ✚ **Dealing with the High Cost of Energy for Greenhouse Operations**, <http://www.ext.vt.edu/pubs/greenhouse/430-101/430-101.html>

**Table 1.** Fuel Increase since 2003 (Source: U.S. Department of Energy).

<b>Fuel Type</b>	<b>Percent increase</b>
Electricity	7.7%
Natural Gas	33.8%
No. 2	44.1%
Propane	29.9%
Kerosene	54.1%
Gasoline	102.5%

**Table 2.** Key costs as a percentage of sales based on 2003 financial data from growers in the Northeast.

<b>Cost category</b>	<b>% of sales</b>
Energy	
Heating Fuel	5.3%
Gas/Diesel	0.5%
Electricity	1.9%
Trucking	0.8%
Energy Total	8.5%
Labor	24.6%
Materials	32.4%
Return to Operator's Labor/Mgt & Equity Capital	11.0%

**Table 3.** Partial Budgeting Effect of 4 degree drop in temperature.

Add:	Before Drop	After Drop	Net Change
Reduced Costs (12% lower fuel costs)	\$271,152	\$238,614	\$32,538
Added Revenues			\$0
Subtract:			\$0
Added Costs			\$0
Reduced Revenues (11% less revenue)	\$2,294,310	\$2,041,936	<u>-\$252,374</u>
<b>Net Return or Loss</b>			<b>-\$219,836</b>

**Table 4.** Costs in 2003 as a percentage of sales, current costs with an energy increase, and current costs with a 5% increase in prices.

	2003	Now	Increase Prices 5%
Sales	\$ 2,294,310	\$2,294,310	<b>\$ 2,409,026</b>
Return to Labor/Mgt & Capital	\$ 216,606	\$ 134,241	<b>\$ 248,956</b>
% Profit	9.4%	5.9%	<b>10.3%</b>
Heating Fuel	\$ 136,036	\$ 196,014	<b>\$ 196,014</b>
Gas/Diesel	\$ 4,407	\$ 8,924	<b>\$ 8,924</b>
Electricity	\$ 33,424	\$ 36,001	<b>\$ 36,001</b>
Trucking	\$ 14,920	\$ 30,213	<b>\$ 30,213</b>
Energy Total	\$ 188,787	\$ 271,152	<b>\$ 271,152</b>
% Energy Costs	8.2%	11.8%	<b>11.3%</b>

## How to Compete When a Big Box Store Moves to Town

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**Index Words:** Marketing, mass market, greenhouse, floriculture, profit

### **Significance to Industry:**

Consider two small towns in the heartland of America: Each has an established small grower; and, both have been invaded by a “Big Box” store. A few years later one grower is bankrupt! What about the other grower? Surviving; and THRIVING!!! **WHY** did one grower finally give-up and close its doors? **HOW** did the other grower not only survive but thrive in the shadow of a Big Box?

To answer these questions, we visited over 80 greenhouse, garden centers, and nurseries in the past two years. Our objectives were to determine:

- How are small growers (wholesale and/or retail) coping with current trends and changing customer preferences?
- How are small growers competing against the Big Box?
- What lessons can growers learn from our research results?
- How can growers incorporate these results into their existing marketing program?

### **Nature of Work:**

We collected data from over 80 greenhouse, garden centers, and nurseries in the past two years on marketing strategies, maintenance of market share, promotional plans and programs, product mix, value-added ideas, agri-entertainment, advertising, demographics, pricing policies, and market channels. Specifically, we were interested in addressing the following questions:

- What happens when a Big Box store moves into town?
- How do small growers react? What strategies do they develop/utilize?
- How have the Big Boxes forced small growers to re-think their marketing strategies?
- How can growers survive/thrive in the shadow of a Big Box competitor?
- What do small growers do to SURVIVE and THRIVE?

**Results and Discussion:**

In our survey of small growers, we encountered perspectives that ran the gamut from complacency, denial, and even panic to confidence and optimism. The successful growers CAME TO TERMS WITH the reality of a **CHANGING MARKETPLACE**. They have accepted that the **Big Boxes are here to stay!** They have learned that *the changing market demands different responses!!* When a Big Box appears on their horizon the two most common resulting strategies utilized by smaller, growers are” **Snooze & Lose**” or “**Change & Prosper.**”

Are Big Box Stores a help or hindrance to the industry? The Big Boxes push prices down and keep prices down, sometimes BELOW the break even costs of some producers.

Successful growers are competing by returning to some marketing basics. The most common success strategies are:

- Knowing and understanding their production costs.
- Planting what’s profitable vs. what they like.
- Developing their niche - Doing what they do best and exploiting that advantage.
- Having a positive attitude - Making lemonade out of lemons.
- Listening carefully to what the customer wants.
- Adding value/service.
- Making buying an experience.

**A Tale of Two Growers....“Snooze & Lose” or “Change & Prosper”**

A typical Main Street grower was doing “business as usual” for two generations. He (please know that “he” may be “he” or “she”) invested little profits back into the family business. He was complacent, neglecting peeling paint, broken glass, and pot holes in the parking lot. His greenhouse looked old and un-kept. He and other growers didn’t protest new parking meters as the town’s answer to limited parking. He had half-hearted promotions and short hours. The greenhouse layout, lighting, displays, and merchandizing were virtually unchanged since construction. The signage was poor. He was slow to catch-on to new trends and to follow the customer’s changing needs and preferences. But, in spite of his lackadaisical management style, the business was generally **still good enough** to allow him to earn a good living and maintain the status-quo.

That was UNTIL a Big Box moved down the road and saw this old established grower as “**Easy Prey.**” A sad but relevant example is what happened to the now bankrupt “Frank’s Nursery”. This Troy, Michigan company, known to most growers, began as a roadside fruit stand in 1949. At the time of Frank’s first Chapter II petition it had 257 stores in 15 states.

Frank's marketing plan could not compete in a changing marketplace. Customers were migrating to local upscale greenhouses and/or garden centers that promoted their **better quality products** or to Big Boxes which pandered to customers who wanted **cheaper prices**. The lack of a response to changing customer preferences coupled with new competitors guaranteed that it was only a matter of time for Frank's. **What lesson can we learn from Frank's failure?**

Frank's retail operations had neither the **cheapest prices** nor the **best quality** products. This was/is a death sentence in today's competitive marketplace. Some of Frank's closed doors re-opened under new ownership. One, in particular is located in Eastern Pennsylvania. An owner/operator of a local, established, and very successful business that encompasses a florist, greenhouse, and garden center division added his former competitor's facility to his greenhouse business. In the same facility where Frank's withered on the vine, this local grower increased its annual sales by 30%! Note that both the current and the former businesses operated in the shadow of Home Depot (less than ½ mile away)!

The new owner sells retail plants that he grows in his greenhouse along with retail hard goods and services to compliment the items he grows. Incredibly, he wholesales some of his product to his Home Depot neighbor!! So, he either sells to customers directly by retailing from his own greenhouse, or indirectly by wholesaling to the local Home Depot. He employs all of the successful strategies of businesses that survive in the shadow of the Big Box store.

His keys to success are that he knows his costs and has developed a niche (actually two: – one retail and one wholesale). He made lemonade out of lemons; i.e., he bought a failed business and made it a success. He knows how critical it is in his marketplace to carefully listen to what the customer wants: variety, service, an informed and friendly staff, and more convenient hours. He understands the value of customer service and pampering. For no additional cost, his staff pots the plants that customers have purchased and, carries them to the customer's car. He has expanded the offers that Franks' sold. He tries to make buying an experience for his customers: he has a huge selection of plants and other products displayed attractively with friendly, knowledgeable sales staff available to assist his customers.

Where Frank's marketing plan did not compete, this local grower thrives, has expanded, and fills the void created by the Frank bankruptcy. He succeeds by responding to a changing marketplace where customers patronize upscale local greenhouse and garden centers or migrate to the Big Box Stores who pander to customers who want **cheaper prices**. A sad end for Frank's became a success story for a local grower.

### **Conclusions**

Successful marketers borrowed strategies from Madison Avenue marketing firms as well as common sense, tried and true, return to basics, and "Take from the past; add to the future" strategies. Here are some of the key strategies the successful ones used:

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- Know your costs.
- Educate your buyers about your quality, value, service, convenience, and selection relative to your competitor's.
- Don't reinvent the wheel.
- Develop your special niche sometimes incorporating "Do what you do best".
- Listen carefully to what your customer wants.
- Make buying an experience – even if you are a wholesaler, make it a pleasurable experience to buy from you.
- Exploit your comparative advantage, and make lemonade out of lemons.
- Upgrade Your Image.

Remember, producers must keep up with what the customer wants. It boils down to ***"Snooze and Lose"*** or ***"Change and Prosper."***

Thanks to all the growers who gave of their time, experiences, ideas, and willingness to help other growers in an ever-changing marketplace and to USDA CSREES for research funding.

## **Marketing and Evaluation of a Streamlined Nursery Industry Educational Program**

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**Index Words:** Short Course, continuing education, impact evaluation, trade show, green industry, extension programming

### **Significance to Industry:**

The annual Ohio State University (OSU) Nursery Short Course (NSC) has provided green industry education for nursery, landscape, garden center, tree care, and turf professionals for 78 years. The NSC is held in conjunction with the Central Environmental Nursery Trade Show ("CENTS"); together, they are one of the largest green industry events (2,900+ Short Course attendees; 11,000+ total attendees, respectively, in 2007). The NSC is well-known and respected for the quality of speakers who present industry updates and current research results. Like most green industry trade shows and conferences in the United States, maintaining and increasing attendance has become a concern. Also, Extension programs in many states now require better measurement of impact. Programming changes, expanded evaluation, and improved marketing of the NSC will positively impact overall program planning and educational content and hopefully reduce declining "CENTS" attendance and booth sales. The decline in green industry trade show attendance and booth sales has been noted by several associations in the United States. The majority of industry associations' operating budgets come from trade show revenues. Downturns in trade show attendance and booth sales are important to Extension in three ways: 1) reduced numbers of registrants to attend educational sessions, and therefore reduced training opportunities for the industry; 2) reduced association income results in reduced support of Extension and research activities in the state; and 3) a reduced ability of the industry to lobby and vocalize industry needs and concerns.

### **Nature of Work:**

The OSU Nursery Short Course is sponsored by the OSU Department of Horticulture and Crop Science (HCS); the OSU Extension Nursery, Landscape and Turf Team (ENLTT); and the Ohio Nursery and Landscape Association (ONLA). The connection between OSU in organizing the Short Course and ONLA in organizing the trade show provides for opportunities to interact and cooperate. The NSC is one of the few remaining major green industry programs where an industry association and the state land-grant university co-sponsor the event. Using the NSC/"CENTS" as a case study, we hope to see if educational programming changes can have an impact on increasing trade show attendance and booth sales.

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A goal of the NSC is to effect changes in basic knowledge and the business practices of session attendees. The Short Course, like other Extension activities, aims to cause a positive change in attitude and/or behavior (2). In January 2007, more than 110 sessions (in up to 10 concurrent tracks on each of three days) and workshops were presented by nationally recognized experts and green industry leaders to more than 2,900 attendees. The 2007 program versus previous years showed an increase in average number of concurrent sessions and an increase in total number of sessions, but a decrease in attendance (by 9 percent since 2005) (Figures 1 a, b, c). This decrease was mainly due to decreased attendance at “CENTS.” The Short Course has stayed, however, at approximately 25 percent of the total “CENTS” attendance. This is much higher than similar programs in the United States where the educational programs typically represent approximately 10 percent of trade show attendance.

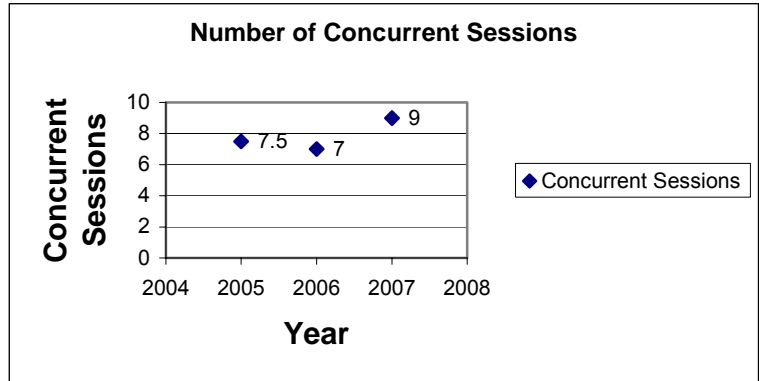


Figure 1a. Number of Concurrent Sessions

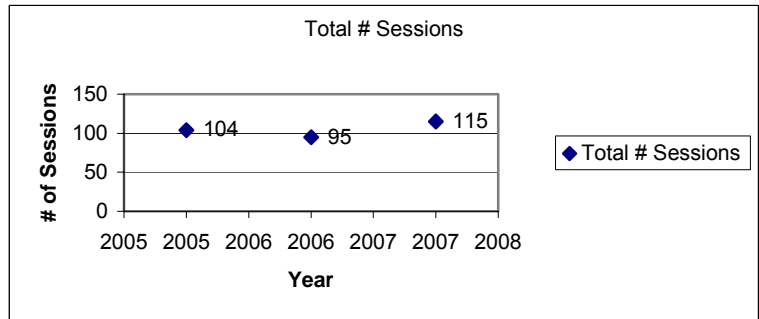
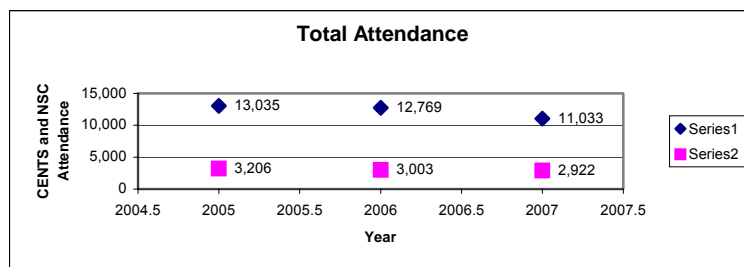


Figure 1b. Total Number of NSC educational sessions.



**Figure 1c. Total “CENTS” and NSC Attendance**

Traditionally, sessions have been scheduled for three days in the morning and afternoon (Monday, Tuesday, and Wednesday); and the topics, while addressing specific industry themes, were placed in somewhat random order on the program. Several program changes were instituted in 2007. Non-competing NSC hours with “CENTS” were implemented in response to a request by ONLA. The revised program allowed attendees more time to attend educational sessions during the morning and several afternoon hours to visit the trade show when sessions concluded. The sessions were organized into tracks of four 50-minute presentations per track, with each track focusing on a different industry segment. For 2007, a track for landscape architects was also added. The track format allowed for a concentration of time on particular subject matter not possible in previous programming. Also new in 2007 were several in-depth workshops held on Sunday and Wednesday afternoons. In 2006 and 2007, a free Sunday evening kick-off session was conducted with a renowned industry speaker. The quality and variety of Short Course speakers also continues to improve; more faculty from other universities, a greater variety of experts at OSU, and industry professionals are being recruited to speak in response to past audience evaluation.

NSC program and speaker suggestions are submitted via several sources, including annual on-site attendee evaluations which use a Likert-scale evaluation. Asking attendees for their opinion is one of the three basic ways (ask, test, observe) to evaluate impact on program participants, and surveys are the primary tool to gather the impact data (2). The OSU Nursery Short Course co-chairs and ONLA NSC planning committee also collect verbal feedback from a variety of industry professionals after each event. The ONLA Grower, Hispanic Relations, Short Course, Landscape, and Retail committees also meet in February and present topics to be covered in the Short Course the following year.

### **Results and Discussion:**

The NSC’s affiliation with the OSU HCS Department, ENLTT, and ONLA provide the event with excellent brand recognition, which is evident in the higher-than-average (25 percent of total) attendance at NSC versus similar programs. Audience responses indicate program materials and session content are well-received, as consistent registration numbers and overall positive evaluation results indicate.

Past on-site evaluations have effectively gathered basic audience reaction to sessions and topics, as well as open-ended comments and future speaker suggestions that were sufficient for programming needs (Table 1). However, in a desire to increase attendance, upgrade program quality, and improve impact evaluation, more thorough evaluations of session content are required. Upgraded evaluations will determine if attendees take home and utilize information and techniques learned at the NSC and if implementation of new practices occurs as a result of attending NSC. An online survey afterward will be implemented to show trends and “hot spots” among a fairly random group of respondents. The Web-based survey will be short in format and turnaround time (1). This type of survey instrument is fairly easy to set up, would appeal to technology-savvy clients, and is cost-effective to implement. Follow-up calls of a random sampling of attendees three and six months after the program will be implemented, as well as a revision of the current Short Course evaluations (Table 1) to collect more than speaker acceptance data. Questions 2 and 4 will be tabulated as program quality indicators from past and current programs. In addition, the annual program committee meeting in February will facilitate a more thorough discussion about the NSC goals.

Improved marketing efforts are an additional benefit of better evaluation strategies. Following analysis of the data collected, impact statements – “concise, but meaningful overviews of program results” – must be written (2). The Short Course now capitalizes on the Ohio State name in print materials, in joint advertising with ONLA, and in program announcements. The addition of quotes or statements that highlight attendees’ reactions to the event and demonstrate their “take-home” knowledge and economic impact on their businesses would be very persuasive to their peers. In extension program development, the emphasis is usually placed on program content as the major marketing tool. However, marketing specialists indicate that conducting market research, knowing the market needs, and evaluating past product success are increasingly important. Future effort needs to focus on the evaluation of true program impact as well as the program content.

**Table 1.** The 2007 OSU Nursery Short Course speaker/session evaluation template.

<b>2007 OSU NURSERY SHORT COURSE Evaluation</b>				
"TRACK" Track				
<b>START TIME • SPEAKER - SPEAKER NAME • SESSION TITLE (merged file)</b>				
<p>For each of the following statements, please circle the column best describing your thoughts regarding this session. Your input is valuable for planning next year's Short Course. Turn this form in to the room monitor as you leave. Thank you.</p>				
			<b>Strongly</b>	
<b>Strongly</b>			<b>Agree</b>	<b>Agree</b>
<b>Neutral</b>	<b>Disagree</b>	<b>Disagree</b>		
I plan to apply this information in my work.			X	X
Overall, the quality of speakers for the OSU Nursery Short Course is excellent.			X	X
Presentation was appropriate and useful.			X	X
Overall, this Short Course improves my knowledge.			X	X
I would like to hear this speaker again.			X	X
Suggestions for future programming: _____				

**Literature cited:**

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## Assessing Consumer Demand for Green Industry Products and Services: Some Considerations for Research

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**Index Words:** Elastic and inelastic demand, price elasticity of demand, total revenues, cross price elasticity, substitutes, complements, nursery products/services, quality.

**Significance to the Industry:** Being able to estimate the demand for nursery products and services is important in correctly determining revenues that can be generated. Demand estimations also allow the calculation of income, price and cross-elasticities of demand. Price elasticity of demand,  $E_p$ , measures the change in quantity of product demanded as price changes, a measure of the sensitivity of quantity demanded due to price changes. The relationship can be represented mathematically as:  $E_p = \frac{\% \Delta Q}{\% \Delta P}$ , where  $\% \Delta$  denotes percentage change. The demand for a product or service can be elastic ( $E_p > 1$ ), unitary ( $E_p = 1$ ) or inelastic ( $E_p < 1$ ). Theoretically, a demand curve can be perfectly elastic ( $E_p = \infty$  or infinity) or perfectly inelastic ( $E_p = 0$ ). If the demand for a nursery product or service has been determined to be elastic, then the percentage change in quantity demanded exceeds the percentage change in price. This has implications for the nursery producer: a decrease in price, when demand is elastic, will lead to increased total revenues while an increase in price would lead to a decrease in total revenues. Conversely, if the demand is inelastic, the percentage change in price leads to a smaller percent change in quantity demanded with the implication that an increase in price for inelastic demand leads to increase in revenues while a decrease in price would lead to a decrease in revenues. If demand is identified as unitary, increases or decreases in price have no effect on total revenues. An understanding of the concept of elasticity is very important in making sound business decisions. In their extensive discussion on demand, Penson, et al. (2006, p. 97), among the many other authors, identified the following factors as having significant influence on the elasticity of demand for specific commodities:

- ▶ Availability of substitutes for the commodity
- ▶ Alternative uses for the commodity
- ▶ Type of market (farm level vs. retail, domestic vs. export)
- ▶ Percent of budget spent on the commodity, and
- ▶ Time

There is little doubt that these factors would similarly affect the demand elasticities for selected nursery products and services. The discussion in this paper points to the need for research to rigorously estimate the demand for the numerous nursery products and services with subsequent determination of the elasticities to help producers in managing their businesses for greater revenues and profits.

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**Nature of Work:** There are few studies to estimate demand for the many products and services provided by the nursery industry. This problem may be due to unavailability of data to make the estimates or the extremely complicated nature of the products and services of the industry. This paper (1) discusses the general concept of demand and demand elasticity estimations and, (2) provides a general framework for understanding factors that influence demand. In assessing consumer demand for nursery products and services, it is important to discuss the guidance provided by economic theory by first making a distinction between quantities demanded and demand. Quantity demanded identifies specific ordered pairs of points (price and quantity) along a given demand curve. The demand curve shows the quantities that consumers are willing and able to buy at each possible price during a specified time period in a specified market, all other factors being held constant. Changes in the price of a nursery product or service prompt changes the quantities of the good or service bought by the consumer. The concepts presented in this paper are based on existing economic principles with possible empirical estimation applications to the nursery products and services industry.

**Results and Discussion:** Consumers buy nursery goods and services as a result of the utility or satisfaction that they expect to get. The consumer's utility function can be viewed as the total "happiness" that the consumer derives from consuming a particular "bundle" of goods and services. The "bundle" of goods and services may include nursery products and services, depending on the consumer's preferences. Every consumer's consumption bundle is constrained by the income available for consuming preferred bundles. The demand function can be derived as a constrained maximization of the utility function subject to the available income, I. The problem can be expressed mathematically as follows:

$$\text{Max } U(x_1, x_2, x_3, \dots, x_n; I) \dots\dots\dots (1)$$

$$I = \sum p_1 \cdot x_1, p_2 \cdot x_2, p_3 \cdot x_3, \dots, p_n \cdot x_n) \dots\dots\dots (2)$$

where  $U(x_1, x_2, x_3, \dots, x_n)$  represents the utility derived from consuming  $n$  commodities available at market prices  $p_1, \dots, p_n$  and  $I$  is the available disposable income.

The demand function derived from solving this maximization problem represents the demand for a nursery product or service. By summing the individual demand curves one can derive the market demand for the goods or services under consideration. The market demand curve is critical in demand studies and has wider importance in analyzing the market for the particular product or service. This paper looks at some research considerations in assessing consumer demand for nursery products and services borrowing extensively from the discussion in Penson, et al., 2006 and Slavin, 1994. Generally, there are economic and non-economic factors that are considered as important influencers of the market demand for nursery goods and services. Such economic factors include the good's or service's own price, prices of related goods, and incomes while some non-economic factors may include composition of population, attitudes towards health, changes in lifestyles, tastes, and preferences, technology, advertising and quality. Nursery producers and sellers need to know how these factors increase or decrease demand. The following



section provides a limited discussion of these factors. Prices of related goods are important in determining demand for nursery products and services. Cross-price elasticity, which measures the responsiveness of the quantities of a good or service demanded to changes in the price of another good or service, provides indications as to which goods and services are substitutes, complements or unrelated. Nursery products or services with large, positive cross-price elasticities point to the fact that the goods or services are substitutes (increase in price of one leads to a decrease in demand for the other, all other things being held constant or *ceteris paribus*) while those with large, negative cross-price elasticity points to the complementary nature of the goods or services under consideration. Zero values of calculated cross-price elasticity shows that the goods or services are unrelated. Increase in population, age, ethnic composition and size distribution of households will act to increase or decrease the demand for nursery products and services. Quality consideration is an important influence on nursery products and services demand. While perception of good quality could expand demand, the opposite effect would occur in low perceptions of quality.

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## Moving From Satisfied Customers to Enthusiastic Customers

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**Index Words:** Customer satisfaction, delight, enthusiasm, retail sales.

### **Significance to the Industry:**

Recent data regarding consumer purchasing patterns indicate that retail sales in the Green Industry are slowing, pointing to a maturing of the industry. This trend behooves retailers to focus on not only satisfying their consumers, but delighting their customers and moving them to higher levels of enthusiastic emotion. To appreciate the distinction between mere satisfaction and complete enthusiasm requires an understanding of what leads to satisfaction and what transforms satisfied customers into enthusiastic customers. Once this distinction is clear, it becomes evident that a focus on satisfaction is not enough. Successful retailers actively create enthusiastic customers.

### **Nature of Work:**

Discussions of customer satisfaction in the literature rarely describe the full set of parameters that lead to a satisfying purchasing experience for consumers of lawn and garden products. However, a recent newsletter authored by David Szymanski of the Center for Retailing Studies at Texas A&M contained several caveats that are pertinent to the Green Industry. In the newsletter, the authors did not discuss the specific facets of the retail experience (e.g., quality, customer service, value/price, convenience, product selection) that add to, or detract from, final satisfaction levels. Instead, they focused on the consumer's mental calculus that determines satisfaction levels, which depend mostly on their estimates of disconfirmation and perceived equity in the exchange.

Disconfirmation is the gap between actual performance of the retailer and customers' expectations of performance and represents what inarguably is the most popular perspective on customer satisfaction. Customers are "just" satisfied when performance equals expectations; "satisfied" when performance exceeds expectations; and "dissatisfied" when performance falls below expectations. Equity, on the other hand, is an assessment of whether the customer is treated fairly as compared to another customer, treatment by another store in the same retail chain, or treatment by another retailer. When customers feel they have been treated fairly, they are satisfied. When they have been treated more than fairly, they are highly satisfied (delighted), and so on along the continuum.

Together the disconfirmation and equity perspectives emphasize the multi-faceted nature of customer satisfaction. At a minimum, consumer expectations

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must be managed so that they are accurate. Performance (service, product offerings, etc.) must be managed so that it exceeds expectations. The customer experience must be managed within the store, across stores, and relative to competition so that perceptions of fairness are positive. A dissatisfied customer will not only complain to as many as ten potential customers but will complain to management (draining management time and resources), take business elsewhere, and hurt bottom-line performance. Consequently, effectively managing disconfirmation and equity levels has positive ramifications for retail success. But it does not guarantee success – simply having satisfied customers is not enough to guarantee profitability.

**Results and Discussion:**

By nature, people strive for favorable emotional responses. Research in psychology and related disciplines shows that normal, healthy people prefer positive rather than negative moods. This explains why people engage in mood repair activities such as eating favorite foods or shopping when feeling negatively. This would also imply that retailers have to minimally exceed basic expectations to make customers highly satisfied. Consumers are receptive and predisposed to being highly satisfied if retailers would just “get it right.” This presents a twofold dilemma. One is how to get it right and the other is why satisfaction is still not enough to guarantee superior marketplace performance. Some companies report high customer satisfaction scores in the face of disappointing sales. Perhaps this occurs because their customers are satisfied but not enthusiastic customers. Enthusiastic customers demonstrate a strong commitment to the retailer. This commitment is heartfelt, long-lasting, and action-motivating. There is a strong sense of consumer identity with the retailer, its employees, and its offerings; as a result, enthusiastic customers are willing to forgive the retailer for subsequent mistakes.

When performance meets expectations, consumers are just satisfied with the offering. When performance exceeds expectations, consumers are delighted. But, when performance consistently surpasses expectations, a higher order state of emotional commitment, attachment, and identification occurs. This higher consumer state is referred to as enthusiasm. It is likely to be most beneficial to retailers for several reasons. Because enthusiastic customers identify with the store and its offerings, they eagerly “tell” other people. In contrast to merely being satisfied customers, enthusiastic customers take the initiative in spreading the word about positive retailing experiences.

A recent study of consumers finds that highly committed customers are willing to pay higher prices and wait patiently and longer for availability when the offering is out of stock or out of production. Committed customers are also more loyal customers. They are more likely to spread the word about their positive experiences, and more forgiving of the company when mistakes occur. Forgiveness is important because zero “defects” are a rarely achieved business goal. Mistakes are inevitable (product failures, service failures, etc.) despite all efforts to avoid them. The “bill” from the customer when failure occurs (i.e., cost of the good +

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opportunity cost of time + nuisance fees + cost of saving face + cost of failed performance + other costs) is typically greater than the price the customer pays for success (i.e., the shelf-price of the offering). In short, highly committed and enthusiastic customers are more likely to stick with the retailer and present a smaller bill when failure occurs.

The most straightforward means of creating enthusiastic customers is to repeatedly exceed expectations so that satisfied customers are also delighted on a regular basis. The specifics for lawn and garden retailers are determined by their ability to connect with customers to find out their preferences and emotional reactions to factors such as alternative assortments, services, and store settings. Is customer enthusiasm a business panacea? Not necessarily. Retail success is much too complex to claim that one phenomenon drives the business.

However, customer enthusiasm offers a new way of organizing thoughts and focusing strategic efforts. Moreover, customer enthusiasm is an important indicant and antecedent of retailer performance. It's also important when judged in terms of other business concepts. They include relationship marketing (wherein retailer-customer bonds are likely to be stronger and more enduring among enthusiastic customers); product innovation (whereby innovation can be looked upon as one of the emotional infusions and breakthrough events affecting customer enthusiasm); customer relationship management (wherein tracking and understanding the underlying shopping behaviors of enthusiastic customers can be critical to sustaining a competitive advantage in the marketplace); and branding strategies (whereby fulfilling the brand promise can also be looked upon as a necessary condition for creating enthusiastic customers).

A new strategic concept, customer enthusiasm, has relevance to retailer performance. The challenge individual retailers face is creatively pursuing a program of fostering customer enthusiasm that fits company competencies and customer preferences. Inarguably, the key is to develop that strategy now before your competitors do. Also, take pleasure in the infinity of the chase. Having enthusiastic customers is not a one-time accomplishment but a continual challenge for retailers.

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## The Golf Course Industry's Contribution to the U.S. Economy

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**Index Words:** turfgrass industry, golf courses, economic impact, *Implan*, multipliers.

**Significance to Industry:** In 2006 a major economic impact study was completed on the U.S. turfgrass industry. The five major sectors included in this study were sod farms, lawncare services, lawn and garden retail stores, lawn equipment manufacturing, and golf courses. This paper presents results of the economic impact study for golf courses nationally and for the top ten states. In that year, the 11,836 U.S. golf facilities generated \$21.8 billion (B) in output impacts, employed 361,690 people, and contributed \$13.5 B in value added. This sector also provided \$7.9 B in labor income and paid \$1.1 B in indirect business taxes.

All 50 states had golf courses with an average number of establishments per state of 237. The fewest number of courses were in Alaska (18) and the most were in California (689). The remaining top 9 included New York (674), Michigan (652), Ohio (646), Pennsylvania (612), Florida (587), Texas (581), Illinois (497), North Carolina (456) and Wisconsin (393). Combined, the top 10 states comprised nearly half (49%) of all golf course establishments in the country. Florida contributed the largest economic impact with \$3.1 B, followed closely by California with \$2.5 B. The remaining eight states had output impacts ranging from New York (\$1.0 B) to South Carolina (\$565 million). Combined, the top 10 states contributed over half (57 percent) of golf course output impacts in the U.S. in 2002.

**Nature of Work:** The turfgrass industry is an important contributor to local economies, made clear in numerous state-sponsored studies (e.g., Florida, 1994 (3); and Maryland and Mississippi, 1996; Missouri, 1998; Wisconsin and North Carolina, 1999; Virginia, 2000; Iowa, 2001; Michigan, 2002; and New Jersey and New York, 2003) (1). Subsequent to Hall et. al.'s 'Green Industry' study and in response to the numerous and often non-comparable state level reports, Turfgrass Producers International (TPI) expressed interest in undertaking a national study. In 2005 an economic impact study of the U.S. turfgrass industry was undertaken covering five major sectors — sod farms, lawncare services, lawn and garden retail stores, lawn equipment manufacturing, and golf courses (2). For purposes of this manuscript, discussion is limited to the golf course industry, the largest economic component of the turfgrass industry by most measures.

Economic information for golf courses — number of establishments, employment, and sales (receipts) — was taken from the 2002 Economic Census Industry Report Series for U.S. totals (7). State-level information on number of firms, employment and payroll were taken from County Business Patterns (6) and were adjusted to

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match the U.S. totals. For some states in which employment and wages were non-disclosed because of a small number of firms reporting, employment was estimated at the midpoint of the range indicated and payroll was estimated at the national average annual wages per employee.

To evaluate the broad regional economic impacts of the golf industry in the U.S., regional economic models were developed for each state using the *Implan* software system and associated state datasets (4). The *Implan* system includes over 500 distinct industry sectors and was based on fiscal year 2001, the most recent secondary data available at the time. The information for these input-output models was derived from the U.S. National Income and Product Accounts, together with regional economic data collected by the U.S. Department of Commerce, Bureau of Economic Analysis. Input-output models represent the structure of a regional economy in terms of the numerous transactions that occur between industries, employees, households, and government institutions (5).

Economic multipliers derived from the models were used to estimate the total economic activity generated in each state from sales to final demand, together with exports. This includes the effects of intermediate purchases by industry firms from other economic sectors (indirect effects) and the effects of industry employee household consumer spending (induced effects), in addition to direct sales by industry firms. The regional *Implan* models were constructed as fully closed models, with all household, government, and capital accounts treated as endogenous, to derive Social Accounting Matrix (SAM) type multipliers, which represent transfer payments as well as earned income. Separate multipliers are provided for output (sales), employment, value added, labor income, and business taxes. The multipliers for output, value added, labor income, and indirect business taxes are expressed in units of dollars per dollar output, while the employment multiplier is expressed in jobs per million dollars output. Differences in values of the multipliers reflect the structure of industry sectors and regional mix of supplier industries. The multipliers were applied to estimated industry sales or output in order to estimate total economic impacts.

**Results and Discussion:** Of the five turfgrass sectors examined in this study, golf courses were the single largest component (37 percent) in terms of economic impact for 2002. In that year, the 11,836 U.S. golf facilities generated \$21.8 B in output impacts, employed 361,690 people, and contributed \$13.5 B in value added. This sector also provided \$7.9 B in labor income and paid \$1.1 B in indirect business taxes. Due primarily to this significance, it should be noted that, although turfgrass is a key input to golf operations, it is not the only one, even though in this study we claimed all the economic impacts of golf courses. For instance, restaurants and lodging establishments rely on turfgrass only indirectly; yet contribute significantly to total impacts.

All 50 states were listed as having golf course establishments. The average number of establishments per state was 237, the fewest number (18) was located in Alaska and the most (689) situated in California. As noted, California is ranked number one with the most golf courses (689), followed by New York (674), Michigan (652), Ohio (646), Pennsylvania (612), Florida (587), Texas (581), Illinois (497), North Carolina (456) and Wisconsin (393). Combined, the top 10 states comprised nearly half (49%) of all golf course establishments in the country. Florida contributed the largest economic impact with \$3.1 B, followed closely by California with \$2.5 B. The remaining eight states had output impacts ranging from New York (\$1.0 B) to South Carolina (\$565 M). Combined, the top 10 states contributed over half (57 percent) of golf course output impacts in the U.S. in 2002.

State-level golf course employment rankings differ somewhat from the output impact rankings discussed above. Florida and California are still number one and two, at 50,938 and 41,858 jobs, respectively. Texas, however, has supplanted New York for third place, which is now number eight. Michigan, which was number six, is no longer in the top 10 and has been replaced by Arizona. Two reasons might explain the change in rankings across states when examining employment numbers. First, golf courses in some states may have invested more heavily in capital to offset the increasing cost of labor. For example, golf courses with more automated irrigation systems and technologically advanced maintenance equipment would conceivably reduce labor needs. Second, some establishments may provide a larger array of member services, such as restaurants and bars, clubhouses, and lodging places that would require additional labor resources. Combined, the top 10 states contributed over half (57 percent) of total golf course employment in the U.S. in 2002.

Value added is perhaps the truest indicator of an industry's contribution to an economy because it represents the value after direct costs have been subtracted. Specifically, value added is gross value less cost of goods sold, which is a net estimate of value. State-level rankings for value added are exactly the same as for output impacts. The top two states in value added were Florida and California with \$1.9 B and \$1.5 B, respectively. The remaining eight states ranged from a high of \$653 M for New York to a low of \$349 M for South Carolina. Altogether in 2002 the top 10 states provided 54 percent of golf course value added in the U.S.

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## Partial Return Analysis of Profitability for a Field Shade Tree Enterprise

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**Index Words:** Horticulture, budgeting, costs. Partial Return Analysis of Profitability for a Field Shade Tree Enterprise

**Significance to Industry:** The purpose of this research is to assist growers in considering the many factors that effect firm profitability. As a purchasing decision, growers need to consider mortality, liner cost, and time to finish. The analysis presents the break-even liner cost level given a certain mortality level. This decision tool allows producers to evaluate their liner purchase decisions with their own purchase information and management experience. This tool can assist managers in evaluating their liner purchases.

**Nature of Work:** This poster examines the degree that plant mortality impacts profitability on field nursery potential returns using partial budgeting techniques. Partial budget analysis is a framework used to evaluate an incremental change in management and/or production plans (Boehlje and Eidman, 1984). For this analysis, partial budget analysis is used to examine the relative changes in potential profitability that results from changing the plant liner size. The analysis examines the mortality effect of three different liner sizes (bare-root, 2-gallon and 5-gallon) on the profitability for red maple nursery production. The study examines the tradeoffs between the liner cost, mortality, and growth rate or time to finish a crop.

As a manager of a field nursery, one decision to evaluate is the liner size for the initial plant production. Research has shown the impact of liner size on subsequent mortality and growth (Gibson and Granberry, 1984). Because of this desirable characteristic, growers can afford to pay substantially more for larger liners because of the improved plant performance in the field. An economic question to consider is what the price premium should be for larger plants. Conversely, the nursery managers would want to evaluate what is an acceptable mortality rate for the relatively cheaper smaller (bare-root) plants.

**Results and Discussions:** To examine this issue, a field trial was set up comparing the field performance of three different liners for autumn flame red maples. The study focused specifically on plant survival and growth in the field. Therefore, the same management and production practices were implemented on the liners regardless of size. Table 1 below details the plant performance over a three year period. The data reflect an ongoing three-year field trial (2003-05) at an Eastern Arkansas container nursery.

Table 1. Growth of Autumn Flame Red Maple in commercial field nursery in Eastern Arkansas, 2003-2005.

	Plant Type		
	<u>Bareroot (BR)</u>	<u>2-Gallon</u>	<u>5-Gallon</u>
<b>2003</b>			
Year-End Trunk Caliper	1.9 <sup>z</sup>	1.3	1.6
Annual Change (%)	90	62	60
Year-End Shoot Height	177	172	187
Annual Change (%)	36	18	4
<b>2004</b>			
Year-End Trunk Caliper	3.5	2.5	2.8
Annual Change (%)	84	92	75
Year-End Shoot Height	309	239	235
Annual Change (%)	74	39	37
<b>2005</b>			
Year-End Trunk Caliper	6.5	5.6	5.8
Annual Change (%)	86	124	107
Year-End Shoot Height	375	324	320
Annual Change (%)	21	36	25

<sup>z</sup>trunk caliper measured at 50 cm. All other caliper measures taken at 100cm.

To evaluate the economic impact of this decision, a spreadsheet-based decision tool was developed to calculate estimated per acre returns for each of the liner sizes. Additionally, the trials used the same planting density for all three liner types. Therefore the only variables evaluated in the decision tool were plant mortality and initial liner cost. The model uses a partial budgeting technique to calculate the partial returns for growing shade trees for the nursery. These partial returns are not the same as profit, since other costs of production still need to be allocated. By examining the plant mortality levels and the liner costs, a producer can evaluate the relative gross profit potential for their nursery among the various liners.

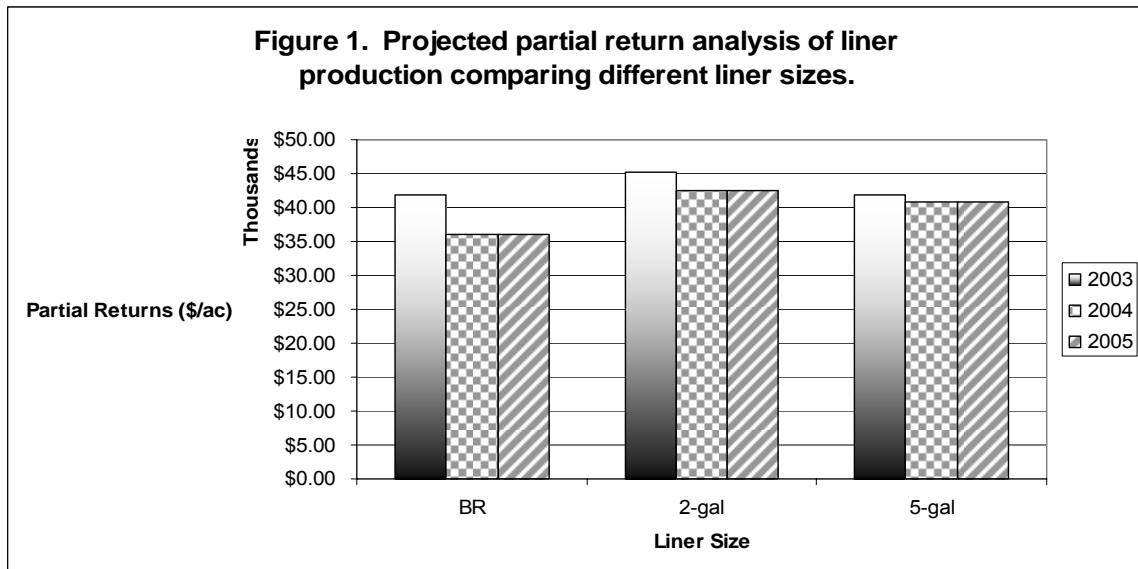
The partial budget uses a standard calculation [(plant x price) x plant survival rate] to calculate the gross revenue potential for each liner's production adjusting the nursery's plant population using plant mortality. In this analysis all other costs were considered the same, except for plant purchase price. Additionally, the plants based on current growth rates will be marketed in the same year at the same price. Table 2 details the two parameters—plant cost and mortality—evaluated in this study. The model compares the economic performance of the three liner types. In 2005 there were no additional losses of plants.

Table 2. Producer input and field results evaluated using a partial-budgeting economic decision tool.

Liner Type	Liner Cost (\$ per plant)	Plant Mortality (%)		
		2003	2004	2005
<b>BR</b>	8.50	12.00	11.00	0.00
<b>2-gal</b>	10.50	4.00	5.00	0.00
<b>5-gal</b>	14.50	6.00	2.00	0.00

The data come from an Arkansas nursery but a producer could use their own records or representative data to evaluate their plant purchase decision. The partial return calculations allow a producer to compare the gross profit potential of the different plant types. Using the analysis given the specified input parameters, the 2-gallon liner purchase would provide the highest potential returns. Figure 1 details the decision tools graphical output. This version of the model assumes that all three different plants will mature at the same marketing period, which was the observation from the field trials. Future versions of the model will consider different times to finish.

It is important to note that these partial returns must cover fixed and variable production costs. The analysis allows producers to examine the relative trade-offs between the different plant types. The model allows producers to identify the break-even purchase prices for different liners as different mortality rates. The model, also allows a producer to set the input prices for the different liners and evaluate the impact of different mortality levels for each plant type. The analysis reveals that the bare-root provides the lowest potential returns given the input data. Using the tool, a producer can make incremental adjustments to determine the price level that the two products provide the same partial returns. Using the field trial mortality data, the 5-gallon liner would have to decrease to 11.45 to provide comparable potential returns to the 2-gallon. Conversely, a producer can examine the impact of different mortality rates on partial returns to evaluate their purchase decisions. Using the tool and the Arkansas field data, the 2-gallon liner's mortality rate can increase from the current rate of 9% up to 12.2% and still maintain a higher partial return compared to the other two liner products.



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## The Impact of Foliage Container Garden Sales on Identifying Consumer Needs, Trends, and Preferences

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**Index Words:** Marketing, Display, Foliage, Container Gardening

**Nature of Work:** Retail garden center sales in Florida have increased from \$3.6 billion in 2000 to \$6.9 billion in 2005 with container garden sales being an economically important component of this trend (1). Urban sprawl is another contributing factor to sales growth because of the increased demand for locally produced plant material. Florida is also a state recognized for wholesale production of foliage. In 2005, foliage plants represented \$476 million of the \$976 million in total sales of floriculture crops (1). Overall, foliage plant production is one of the leading areas of growth amongst all U.S. grown floriculture crops (2). Changes in cultivar numbers of major foliage plant genera have steadily increased since the 1970's (3).

Growth of retail garden center sales and the popularity of container gardening has created an opportunity for the foliage plant industry to introduce more foliage plant material to consumers. The need to measure the consumer impact of foliage plants used in container gardens is paramount. In addition, determining if retail sales are connected to the placement of these foliage container gardens within the retail setting is a research priority. Therefore our objective in this study was to record purchase behavior and gather demographic information of consumers buying foliage plant container gardens from different areas of a retail setting.

Two Florida-based retail studies were conducted in the spring of 2007. Study 1 took place at the Emerald Coast Flower Festival on the campus of the Pensacola Junior College on 31 March and 1 April, 2007. This study consisted of five types (Table 1) of foliage container gardens in terra cotta-colored, 12-inch round pots (30.5-cm). Each foliage container garden contained three foliage plants: one upright, one mounding and one trailing plant. Foliage plants were combined on the basis of vigor, water and light requirements. Ten replications of each foliage container garden type were displayed in three different retail areas. Locations included the landing zone (before the entrance), transition zone (from entrance to just inside), and the destination zone (within the retail setting). Display areas measured 3 ft x 10 ft. raised 3 ft. off of the retail floor. Study 2 was repeated in the same manner as the first, except its location at the University of Florida-Gainesville student plant sale on April 14-15, 2007. This study consisted of four types of foliage container gardens (Table 2).

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In Studies 1 and 2, consumer preferences and demographics were measured using an identical post-purchase survey. On the survey, twelve questions were asked. The questions included: Did you purchase a Foliage Container Garden today? yes or no; Which answer best describes your reason for purchase? for exterior: patio/deck/porch, interior houseplant, good combination of plants, as a gift, unique or unusual; How often do you purchase plants? yearly, every 6 months, seasonally, monthly, every 2 weeks, weekly; How long have you been involved in gardening? less than 1 year, 1 to 5 years, 5+ years; How familiar are you with the plants in the foliage container garden(s)? all new to me, somewhat new, neutral, somewhat familiar, very familiar; How likely are you to come back and buy a similar foliage plant? not likely, possibly, very likely; Gender: male or female; Age range: 15 to 24, 25 to 34, 35 to 44, 45 to 54, 55+, Household yearly income: ≤ \$29,000, ≥ \$30,000, ≥ \$50,000, ≥ \$70,000, ≥ \$90,000, ≥ \$110,000, ≥ \$130,000, ≥ \$150,000; Highest level of education that you've completed: less than high school, high school/GED, some college, 2-year college degree, 4-year college degree, graduate degree; Number of adults in household, 18 years old or older; Number of children in household younger than 18 years old.

**Results and Discussion:** In Study 1, 77.78% of all purchases were made in the landing and transition zones. Foliage container types 3 and 5 constituted the majority of the sales with 75.56%. A similar number of sales took place at all three locations in Study 2. Foliage container types 2 and 3 provided the majority of the sales (67.5%).

There were a total of 56 post-purchased surveys collected from the two studies. Results from the post-purchase surveys in Studies 1 and 2 were combined to determine consumer preferences of the foliage container gardens along with demographic information. Primarily consumers (57.1%) made a foliage container garden purchase for their own homes as an exterior plant for their deck, patio, or porch. Furthermore, 28.6% answered they were purchasing due to a good combination of plants or because the containers were unique or unusual. The majority of the consumers make plant purchases on a seasonal basis or more often (82.2%). These consumers have been gardening for at least five years or more (78.6%). Consumers that thought the foliage plants displayed were all new to them or somewhat new made up 39.3% of the population, whereas versus 53.6% of the consumers said they were somewhat familiar to very familiar with the plant material (7.1% were neutral). Only one person indicated they would not likely come back and buy a similar foliage plant, otherwise 25.0% of the consumers said possibly and 73.2% said very likely. The customers in this study were mostly female (83.9%) with an age of 45 or above (67.8%), a yearly household income of \$50,000 or above (69.6%) along with a college degree (73.2%). Most households consisted of two adults (60.7%) and no children under 18 years of age (78.5%).

**Significance to Industry:** One of the goals of the National Foliage Foundation is to find new ways of utilizing and marketing foliage plants. The florist dish garden, which is primarily composed of foliage plants, was made popular in the 1970's. Now in the 21st century, it is crucial for the foliage industry to seek additional markets of growth with the large number of new foliage plant cultivars. This study looked at one possible outlet for the foliage plant industry, their use in outdoor container gardens. Our research suggests that the foliage container gardens were primarily purchased for use as an exterior container garden. Also important was constructing an aesthetically pleasing foliage plant combination and adding unique or unusual plant material to the container gardens. Nearly 40% of the respondents stated they were not completely familiar with these foliage plants. This is a significant percentage especially since the majority of consumers said they have been gardening at least five years or more and purchase plants on a frequent or at least a seasonal basis. This suggests informational signage and care instructions should accompany these container gardens to help eliminate consumer hesitation towards foliage. Our research also suggests that more sales occurred in the landing and transition zones, therefore retailers should consider displaying a significant amount of product in the store front.

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Table 1. Foliage container garden types displayed in Study 1.

Type	Upright plant	Mounding plant	Trailing plant
Type 1	<i>Dieffenbachia</i> 'Carina'	<i>Alocasia</i> 'Cuprea'	<i>Cyanotis somaliensis</i> 'Fuzzy Jew'
Type 2	<i>Colocasia esculenta</i> 'Ruffles'	<i>Chlorophytum</i> 'Fire Flash'	<i>Syngonium</i> 'Neon'
Type 3	<i>Xanthosoma Aurea</i> 'Lime Zinger'	Rex Begonia 'Escargot'	<i>Nephrolepis biserrata</i> 'Macho Fern'
Type 4	Sensation cordyline	Petra Croton	<i>Philodendron</i> 'Prince of Orange'
Type 5	<i>Xanthosoma lindenii</i> 'Magificum'	<i>Dryopteris erythrosora</i> 'Autumn Fern'	<i>Alternanthera</i> 'Burgundy Thread'

Table 2. Foliage container garden types displayed in Study 2.

Type	Upright plant	Mounding plant	Trailing plant
Type 1	Sundance cordyline	<i>Calathea</i> 'ornata'	<i>Dryopteris erythrosora</i> 'Autumn Fern'
Type 2	Kiwi cordyline	<i>Alternanthera</i> 'Burgundy Thread'	<i>Dryopteris erythrosora</i> 'Autumn Fern'
Type 3	<i>Colocasia esculenta</i> 'Ruffles'	<i>Syngonium</i> 'Neon'	<i>Cyanotis somaliensis</i> 'Fuzzy Jew'
Type 4	Sensation cordyline	Petra Croton	<i>Philodendron</i> 'Prince of Orange'



## Economics of Renewable Energy Alternatives for the Green Industry

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**Index Words:** renewable energy, economics, wind, solar, biomass, finance

**Nature of Work:** Alternative renewable energy – what is it, and why the sudden popularity as a topic of discussion? The concept of renewable energy means sources of energy that are replenished, replaced, or renewed on a short, active timeframe. Oil is being made under the earth's crust somewhere, but the timeframe is measured in millions of years. Sun, wind, and flowing water are perpetually renewed on an active basis. Biomass from trees and grasses have an annual or longer cycle but are still renewable energy sources within our perception of an active timeframe, as would be the use of manure and other wastes for anaerobic digesters.

As to why the focus of conversation at meetings, around water coolers or any place individuals may congregate the realizations of the past few years are hard hitting on the cash flow as energy consumers experienced first hand how price rations supply, especially when a disruption in availability occurs due to weather, embargoes, conflicts or loss of production capacity. The entrepreneurial spirit has combined with the desire, if not the need, to find and use alternative energy and/or fuel sources to substitute for the energy utility companies, whether natural gas, propane, electricity, or the “pour” fuels of gasoline and diesel fuel. For greenhouse and nursery operations needing energy for heating, fans, lighting, irrigation, potting, computers, etc., getting off the electrical grid and/or not having the propane dealer on speed dial in the winter means more profit and lower energy expenses.

**Results and Discussion:** Reducing energy costs – are there any easy solutions? There is not a magic bullet that addresses every green industry business's woes. Although the goal of this economic analysis is to calculate the economics of alternative renewable energy sources, prior to doing so requires a review of not only the annual or seasonal expenses, but a scrutiny of the peak energy consumption amounts and times. Doing an energy audit means not only having a heart to heart discussion on energy conservation with the employees, but evaluating what the goals of the business are in terms of cropping mix, desired market position and pricing strategy, reviewing policies and procedures for production and distribution and technology, and considering what might be re-tooled over time, such as greenhouse glazing, heat curtains, and new heaters/boilers. Then, and only then, will it be wise to do the homework on energy alternatives.

What alternative energy options are available to nurseries and greenhouses? The National Renewable Energy Laboratory (NREL) states that many renewable energy technologies are available to be used in production, marketing, distribution, and family-living. Technologies that are commercially available today include biofuels,

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biopower, bioproducts, geothermal heat pumps, geothermal direct use, hydroelectric power, passive solar heating, photovoltaic (solar cell) systems, solar hot water systems, and wind energy – however, there is not a one size or one option fits all. Some of these technologies are better suited for “pour” fuel replacements while others are designed to get the user off of the electrical grid.

The National Renewable Energy Laboratory (NREL) addresses energy uses that are environmentally and economically sustainable, and offers many publications online at their website, [www.nrel.gov/learning/](http://www.nrel.gov/learning/). The Office of Energy Efficiency and Renewable Energy (EERE) maintains a gateway to hundreds of web sites and thousands of online documents on energy efficiency and renewable energy at their info portal, [www.eere.energy.gov/](http://www.eere.energy.gov/). However, these websites offer mostly factsheets on the what’s, where’s, how to’s, and guidelines for use, but very little on the economics, especially as it might apply to specific business functions such as greenhouses and container or field nurseries. The Database of State Incentives for Renewables and Efficiency (DSIRE) should also be referred to for local, state, and federal incentives at its website, [www.dsirusa.org/](http://www.dsirusa.org/), including materials from multiple agencies.

Regardless of the choice of an alternative renewable energy source or technology, the decision will mean change, and with that change will be a financial investment in the new technology, including retrofitting existing energy conduits and retraining employees on the efficient and effective use of the technology. Granted, the initial driver for the change may be the cash flow aspects of paying for an energy or fuel bill, the ultimate decisions should hinge on what the investment in a new alternative renewable energy technology will do for the business in financial and economic terms. To do so requires an analysis of the cost or expense savings of the new technology versus the existing technology as well as the investment cost. Four generally accepted financial analyses that can be performed include the payback period, the simple or accounting rate of return, the net present value, and the internal rate of return.

The payback period (pbp) and the simple accounting rate of return (srr) are static analyses that do not include the concept of the time value of money. The payback period is calculated by dividing the investment cost by the annual savings, resulting in the years to recoup the investment. Fewer years are preferred to more when doing the division, but it is a management decision as to the maximum limit on an acceptable timeframe (years of the payback period). The simple accounting rate of return is merely the inverse of the payback period, as it is calculated by dividing the annual savings by the investment cost, which generates the percentage return expected from the investment. This rate of return should exceed the stated cost of borrowed capital realized by the firm for the investment to be acceptable.

The net present value (npv) solution and the internal rate of return (irr) do utilize the concept of the time value of money. The net present value is the dollar value representing the difference between the present value of the annual savings at an

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interest rate and timeframe (management's decision) minus the investment cost. The net present value is the expected dollar value to be realized over the investment's useful life net the acquisition cost. A positive dollar value is an absolute necessity, while management may have a minimum value necessary for the investment. The internal rate of return is the discount rate when the calculated net present value is forced to equal zero. Without a financial calculator, this solution is a matter of trial and error. The greater the net present value, however, the higher the internal rate of return.

The financial analyses of four alternative renewable energy sources and technologies follow:

Renewable Energy Source	Financial Determinant			
	PBP	SRR	NPV	IRR
Small Wind (kW, 10 years)	4 – 5	25 – 20	\$63,000	10 – 17
Photovoltaics (kW, 10 years)	2 – 3	50 – 33	\$42,000	9 – 11
Anaerobic Digester (BTU, 10 years)	4 – 7	40 – 30	\$28,000	7 – 10
Biomass Burner (BTU, 10 years)	5 – 9	20 – 11	\$16,000	5 – 8

**Significance to Industry:** Actual project costs can vary substantially based on variables such as site and permitting costs, land costs, transmission access, labor costs, financing terms, and input costs. States vary, as well, as to tax credits, production tax incentives and subsidies, loan programs, and specific financial incentives for renewable energy – all of which add to the positive economic and financial picture for investing in alternative renewable energy technologies.

## What Are the Factors Affecting Export of Nursery Products from the United States?

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**Index Words:** Nursery Products, Export, United States, Opportunities and Challenges.

### **Significance to the Industry:**

The demand for nursery products in the United States while strong varies depending on economic condition in the country at a given time. During a period of economic downturn sales will decline and vice versa. This suggests that export can provide means to diversify income of nursery businesses. Moreover, with a growing middle class population in many countries, nursery businesses can expand their customer base beyond the U.S. It should however be noted that for nursery businesses to succeed in the export market they have to compete in the emerging marketplace and meet specific import regulations in different countries. Table 1 summarizes the value of U.S exports and the percent change for the period 1997-2005. It shows decline in export of nursery products to East Asia, some South American and Caribbean countries while increases were seen for Canada, Italy, the Netherlands, Spain, and Australia.

### **Nature of Work:**

This work identified and analyzed factors affecting export of nursery products using mail survey data collected from nursery businesses that export nursery products from 11 states. The majority of exporters are from Tennessee and Florida (Table 2). Southern Nursery Association (SNA) and Tennessee Department of Agriculture (TDA) list of nursery businesses were used to randomly select businesses for the survey. Questions covered in the survey include the type of nursery products exported, destination of export, characteristics of the operators and their operations, trade show attendance, operators' current level of export, their future plan as well as factors affecting export (Table 3).

### **Results and Discussion:**

Results show that 64% of the exports each went mostly to the NAFTA and European Union countries. Canada is the largest importer as it is a country with higher income than Mexico. The major buyers of U.S nursery in the European Union include the Netherlands and Italy. In Asia, Japan and China are the main customers. South Africa and Costa Rica are the major customers in Africa and Central America respectively. In the Caribbean region, Bahamas is a major export destination. Other major export destinations are Australia and Ecuador.

The majority of the nursery businesses (56%) exported products such as woody ornamentals, bare-rooted trees, caladium bulbs, daylilies, and hosta. The analysis showed that 52% of the respondents have been in the nursery business for over 10 years. Majority of the businesses (68 %) are organized as corporations. All businesses that currently export indicated that they plan to continue exporting nursery products. The results also show that 88% of the exporters indicated their export was 10% or less of their nursery production. In terms of trade show attendance, 92% of the exporters attended local shows while only 33% attended international trade shows. Only 8% of the exporters claimed they have nursery operations outside the U.S. When asked about their future plan regarding their nursery operations, 80% indicated that they wanted to expand their operation while 12% want to maintain the same level of operation. The top five problems faced by the businesses exporting nursery products are: 1) restrictions to foreign markets due to Sanitary and Phytosanitary (SPS) regulations (48%); 2) knowledge of trade legislation and /or political considerations in the countries to which products are exported (20%) ; 3) international transport logistics, including freight coordination and insurance liability (20%); 4) poor guidance concerning assistance with export questions (20%) and 5) absence of coordinated firm oriented trade services network (Table 4).

It can be discerned from the foregoing results that while U.S. nursery businesses have potential export opportunities, effective realization of such opportunities will require effort both by the businesses themselves and technical assistance from public and private organizations. U.S nursery businesses should develop links with businesses in the importing countries through visits and increased international trade show attendance as our findings shows that 48% of those surveyed indicated that their export began through personal visit to the countries to which the products are exported. Existing trade promoting regional and national bodies should be strengthened to enable exporters have current information regarding business opportunities and regulations governing trade including those by the World Trade Organization (WTO) involving Sanitary and Phytosanitary (SPS) agreement (WTO SPS).

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[http://www.wto.org/english/tratop\\_e/sps\\_e.htm](http://www.wto.org/english/tratop_e/sps_e.htm)

Table 1: Value of U.S. exports by region and country, 1997-2005

Destination Region/Country	1997	2001	2005	% Change (97-05)
	...Million Dollars...			%
<b>NAFTA</b>	148.4	163.1	194.3	31%
Canada	118.1	137.4	167.2	42%
Mexico	30.2	25.7	27.1	-10%
<b>Central America</b>	1.9	1	0.8	-58%
<b>Caribbean</b>	5.5	8.7	10.6	93%
Bahamas	1.2	2.3	3.9	225%
Turks & Caicos Is.	0.2	0.3	2.7	1250%
<b>South America</b>	6.5	3.5	3.8	-42%
Chile	0.6	0	0.5	-17%
Colombia	1	1.6	1.6	60%
Ecuador	2.5	0.9	1.1	-56%
<b>European Union</b>	76.5	67	85.9	12%
Belgium	2.7	2.2	0.8	-70%
Denmark	0.6	0.5	0.6	0%
France	1.6	1.3	0.6	-63%
Germany	19.7	11.1	8.6	-56%
Italy	1.2	1.2	4.9	308%
Netherlands	43.2	45.1	63.4	47%
Spain	0.8	2	2	150%
United Kingdom	6	3.6	4.6	-23%
<b>Asia</b>	40.1	18.2	13.5	-66%
<b>East Asia</b>	38.5	17.7	12.9	-66%
China	1.9	1.1	1.8	-5%
Hong Kong	11.8	1	1.1	-91%
Japan	19.4	12.1	7.6	-61%
South Korea	2.7	1.5	0.7	-74%
Taiwan	2.8	2.1	1.8	-36%
<b>Southeast Asia</b>	1.5	0.2	0.5	-67%
<b>South Asia</b>	0.1	0.2	0.1	0%
<b>Oceania</b>	0.7	0.5	1.9	171%
Australia	0.4	0.3	1.3	225%
<b>Middle East</b>	0.6	0.9	0.9	50%
<b>Africa</b>	0.5	0.5	0.5	0%
<b>Rest of the world</b>	2.1	0.7	0.2	-90%
<b>World</b>	<b>282.8</b>	<b>264.2</b>	<b>312.4</b>	<b>10%</b>

Source: USDA-ERS, FLO-2006

**Table 2: Mail Survey response received by State**

<b>State</b>	<b>Percentage (%)</b>
Tennessee	28
Florida	24
Georgia	8
Oregon	8
North Carolina	4
South Carolina	4
Connecticut	4
Alabama	4
Michigan	4
Texas	4
California	4

**Table 3: Some Characteristics of respondents and their businesses**

<b>Age</b>		<b>Respondents (in %)</b>
	Less than 30 years	0
	30-45 years	36
	46-55 years	32
	56-65 years	16
	66-75 years	8
	Greater than 75 years	4
<b>Education</b>	High School/ GED	8
	Some College	24
	Undergraduate Degree	48
	Graduate Degree	20
	Trade School	0
<b>Years in Nursery Export</b>	Less than one year	4
	1-3 years	12
	4-5 years	24
	5-10 years	4
	Greater than 10 years	52
<b>Start of Nursery Export</b>	Through personal visit to the country exporting to	48
	Through resident representative in the importing country	12
	Through trade shows and negotiations at the shows	52
	Other	20
<b>Export Business Arrangement</b>	Direct retailers	40
	Contract with others in importing countries	32
	Contract with others domestically	12
	Own export company	12
	Others	12
<b>Organizational form of the business</b>	Individual Proprietorship	8
	Partnership	4
	Corporation	68
	Family Owned	32



**Table 4: Type and ranking of problems faced in exporting nursery products**

Problems	Not a Problem (in %)	Minor Problem (in %)	Not a Major Problem (in %)	Major Problem (in %)	Mean
Restrictions to foreign markets due to sanitary and phytosanitary regulations	12	20	12	48	3.04
Knowledge of trade legislation and/or political considerations in countries to export	12	44	16	20	2.48
International transport logistics, including freight coordination and insurance liability.	24	32	16	20	2.35
Poor guidance concerning assistance with export questions	28	28	12	20	2.27
Absence of coordinated firm-oriented trade services network	28	32	16	12	2.14
Availability of risk insurance for international transactions.	32	28	12	12	2.05
My company lacks expertise in developing international marketing plan with goals and strategies	36	28	12	12	2.00
Absence of worldwide product-specific information on market conditions	28	36	16	4	1.95
Risk of default on payment by buyers overseas	48	20	12	12	1.87
Difficulty in finding workers having knowledge or interest in learning and willing to travel to other countries	52	8	12	12	1.81
Negotiating with foreign buyers	52	12	16	8	1.77
Lack of capital resources and limited size of operation.	48	36	4	4	1.61

1 represents not a problem and 4 represents a major problem

## Determining the Cost of Producing Turfgrass in Mississippi

Zhen Xu, Randall Little, Ken Hood, and Wayne Wells

**Index Words:** production costs, enterprise budgets, turfgrass production

**Significance to Industry:** The turfgrass production sector of agriculture has increased in importance in recent years. Trends in turfgrass production in Mississippi follow national trends. Much of the growth has been driven by population growth, increasing disposable incomes, and low interest rates, which have combined to stimulate demand for new home construction. According to Hall, Hodges, and Haydu (2005), the increase in new home construction, commercial businesses and schools resulted in a marked increase in the demand for landscape materials and services, including turfgrass. Increasing demand in a market suggests potential for profits. However, accurate identification of associated costs of production is critical in any market, turfgrass included.

This paper reports estimates of costs of production for selected types of turfgrass produced in Mississippi. Enterprise budgets are important decision aides managers can use to improve firm level decision making. Completion of enterprise budgets requires careful consideration of resources used, quantities and input prices, in a production process. This process of identifying resources used and their costs forces managers to consider, step by step, the timing and quantities of the inputs they use in a production process. Thus enterprise budgets provide important information for planning, and ultimately with choices regarding enterprise mix, expansion, and production pricing, among others.

Enterprise budgets also provide important benchmarks for lenders to use as they evaluate credit worthiness. With the objective measures of direct and indirect costs of production, lenders have a much more comprehensive assessment of a firm's repayment capacity and expected profitability. The fundamental cost of production information in an enterprise budget is key to effective risk management and planning.

**Nature of Work:** Turfgrass cost of production budgets have not been generated for Mississippi in some time. The last comprehensive effort was by Hall in the late 1980s. More recently, Martin and Wells provided some information for individuals interested in entering the industry.

The purpose of the research reported in this paper was to determine the cost of producing turfgrass in Mississippi, assuming an existing operation. Thus, costs of establishing turfgrass are not included. A select group of producers were interviewed to help identify key input usage levels. Interviews and visits were targeted to sod production farms in Mississippi that ranged between 300 to 400 acres.

**Results and Discussion.** Direct cost estimates for sod production budgets were derived from grower interviews, farm records and sod farm visits. Direct costs were totaled for all sod farms interviewed and an average cost per input was calculated. The results are summarized in Table 1.

Table 1. Estimated Average Annual Direct Expenses for 350 acre Sod Farm in Mississippi.

		<b>per acre</b>
Herbicides	\$ 18,843	\$ 54
Insecticides	\$ 11,050	\$ 32
Fertilizer	\$ 66,877	\$ 191
Lime	\$ 3,600	\$ 10
Fuel & lubricants	\$ 119,353	\$ 341
Repair & maintenance	\$ 50,899	\$ 145
Labor	\$ 257,289	\$ 735
Supplies (includes pallets)	\$ 24,473	\$ 70
Irrigation	\$ 11,760	\$ 34
Misc.	\$ 14,561	\$ 42
Interest on operating capital @ 9.5%	\$ 27,488	\$ 79
<b>Total Direct Expenses</b>	<b>\$ 606,193</b>	<b>\$ 1,732</b>

Direct costs totaled an estimated \$1,732 per acre. At just over 42% of total direct expenses, labor was, by far, the dominant input cost item. It was followed by fuel and lubricants (19%), fertilizer (11%), and repairs and maintenance expenses (8.4%).

The estimated capital investment requirements for the assumed sod farm are presented in Table 2. Fixed costs were estimated using these assumptions.

Depreciation was estimated using the straight-line method with zero salvage value, given the estimated life of the equipment. Taxes were estimated based on 15 percent of total taxable assets multiplied by an average tax mileage rate (.0875) for Mississippi. Interest on investment was calculated as 9 percent over a 7- year period on 80% of the total investment. There are no charges for management, marketing, or transportation to markets. The total annual fixed costs for a 350 acre sod farm in Mississippi are summarized in Table 3. Depreciation on machinery, equipment, and buildings is the key component of fixed costs. Interest on capital investment is also a major fixed expense item.

Table 2. Estimated Capital Investment for 350 acre Sod Farm in Mississippi.

				Cost \$	Depr.
Land	360 @ \$900/acre			324000	
Buildings	2500 @ \$29/sq.ft.			72500	2339
Well/pump/risers				80000	8000
<b>Tractors</b>					
50 hp	1	23706		23706	2371
75 hp	1	42714		42714	4271
90 hp	1	44288		44288	4429
<b>Site Prep</b>					
Disk	10ft	1	14270	14270	2039
Harrow		1	9202	9202	1315
Roller	5ft	1	1340	1340	191
Sprig planter		1	15600	15600	2229
Seeder		1	2925	2925	418
<b>Spin spreader</b>					
5 - ton		1	10835	10835	1548
<b>Boom Sprayer</b>					
42ft		1	7800	7800	1114
<b>Rotary Mower</b>					
15ft		2	13517	27034	3862
<b>Irrigation</b>					
Traveling gun		2	26000	52000	7429
<b>Harvesters</b>					
Small Block		2	65000	130000	18571
Large Roll		1	50000	50000	7143
<b>Other</b>					
Field forklift 2.5 ton		2	29000	58000	8286
Trailer 45ft		1	27500	27500	2750
Bush hog		1	870	870	174
Utility vehicle 20hp		1	9725	9725	1945
<b>Trucks</b>					
Pickup		1	27892	27892	5578
Tantum axel		1	70000	70000	14000
Truck lift 4500		1	24700	24700	4940
<b>Total</b>				<b>\$ 1,126,901</b>	<b>\$ 104,941</b>
<b>Total average investment per acre</b>				<b>\$ 3,130</b>	

Table 3. Total Annual Fixed Cost for 350 acre Sod Farm in Mississippi.

		<b>per acre</b>
Depreciation	\$ 104,941	\$ 300
Insurance	\$ 32,669	\$ 93
Taxes	\$ 14,791	\$ 42
Interest on Investment	\$ 77,207	\$ 221
<b>Total annual Fixed cost</b>	<b>\$ 229,607</b>	<b>\$ 656</b>

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