

HOMEOWNER INTEREST IN ENVIRONMENTALLY FRIENDLY GARDENING PRACTICES: A GEORGIA SURVEY

Gardening is a popular leisure activity for many Americans. More than 80 percent of households in the United States participate in gardening activities (Behe & Beckett, 1993). Moreover, each year, Americans spend more money tending their landscapes. In 1997, national nursery and greenhouse operations sales totaled \$10.9 billion, a 43 percent increase from 1992 according to the 1997 Census of Agriculture (USDA Statistical Bulletin, 1999). The National Gardening Survey reported that retail sales for lawn and garden activities increased by 13 percent, to a total record of \$30.2 billion, in 1998 (Butterfield, 1999). The national average spent per household increased by 17 percent to \$452 in

Preventing pollution from residential lawns and gardens

1998 (Butterfield, 1999).

The environmental horticulture industry is composed of related commodities including greenhouse, nursery, and turfgrass crops, as well as the services associated with their use. Georgia's environmental horticulture industry generates \$1.06 billion per year (Georgia Agricultural Statistics Service, 1998).

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survey will fill in a knowledge gap about homeowner behavior and facilitate the development of instructional materials and training programs. Such materials and programs are intended for dissemination among the general public and professionals to encourage a change in behavior and reduce possible environmental damage from chemical applications on private landscapes.

Survey Methods and Procedures

The survey was conducted in Georgia to determine homeowner practices using fertilizer and pesticides, as well as their knowledge of and interest in pollution prevention practices as they relate to gardening. The survey results provide a rare glimpse of homeowners' behavior and will enable scientists to concentrate their research, education, and outreach to the appropriate groups.

The first step in the process of conducting this study involved development of the survey instrument. A team consisting of agricultural economists, entomologists, horticulturists, and environmental specialists drafted a questionnaire concerning attitudes towards landscape maintenance. The questionnaire was then revised in cooperation with Survey Research Center (SRC) staff, and it was pre-tested. The pretest procedure uncovered no problems with the understanding of the survey instrument, and the data collection proceeded.

To minimize interviewer bias, telephone interviewers attended two three-hour training sessions prior to survey implementation. These sessions covered survey methods, standard procedures of telephone interviewing, the purpose of the survey, an in-depth explanation of the survey instrument, and a practice session. Supervisors were assigned to monitor interviewers in progress. Approximately one-fifth to one-quarter of all interviews were monitored, and any interviewer errors were eliminated.

A statewide survey of adult Georgians was conducted by the Survey Research Center during May and June, 1999. The design of the study called for conducting a total of 400 telephone interviews from an RDD (random digit dialed) sample of Georgia residents 18 years and older. The procedures ensured that all adult Georgians had an equal chance of being selected for inclusion in the sample. The final sample represented a random sample of Georgia homeowners. Bias in response was minimized and inferences about the general population were made from the obtained results.

Actual generation of the telephone numbers called was the result of a single-stage systematic sampling procedure.

The procedure produces a self-weighting sample with equal probabilities of selection (EPSEM) for all residential telephone

numbers in the defined sample universe, the state of Georgia. The result of this procedure ensures an equal and known probability of selection for all residential households in the state, a necessary condition for producing a probability sample that allows generalizations from the sample to be made to the entire population.

Assuming that the sampling procedures outlined above produce a random sample of the population of interest, the expected standard error associated with the sample estimates obtained ($n=400$), when the population proportion (P) is 50 percent (i.e., a "worst case scenario"), is .025. In addition, the theoretical standard error decreases as the proportion (P) approaches 0 or 100. Thus, if 85 percent of the sample provides a given response, the standard error is .0178. Sampling error is no greater than ± 4.9 percent, with a 95 percent level of confidence. This expected sampling error decreases as the sample proportion approaches either 0 or 100.

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In addition to sample size, the quality of the sample was determined by response rate—i.e., the proportion of members of the original sample who fully completed an interview. **Exhibit 1** shows the final aggregation of the 3,018 telephone subscribers called in the study. The cooperation rate for the study was 61 percent based on 1,095 contacted households and 671 respondents who completed interviews. The number of interviews excluded from the survey was 271 because these respondents did not own a house.

Characteristics of Survey Respondents

Interviewers probed homeowners for their opinions about gardening practices and products and their interest in learning pollution prevention practices for gardening. Demographic and socioeconomic information was also requested from the respondents. Survey results will be used to develop or enhance effective educational and pollution prevention training programs tailored to specific homeowner groups.

Exhibit 2 shows national and Georgia resident profiles, along with national and Georgia

gardening survey respondent profiles. In comparing the profiles of national sample and Georgia residents, it can be seen that gender, education, and median income are similar. National residents are slightly better educated, with 50 percent having completed some college, a college degree, or postgraduate work, while 46 percent of Georgia residents have attained that level of education. The median age of Georgia residents is 34 years, younger than that of the national sample (40 years). This is likely due to the influx of young people to Georgia, where the job market has been strong for almost a decade. In the last ten years, metro Atlanta employment grew by 40 percent, adding 600,000 new jobs (Georgia Chamber of Commerce, 2000). In addition, Georgia has a greater share of rural population (37 percent) than the United States as a whole (25 percent). Georgia has been traditionally an agricultural state.

In comparing the National Gardening Survey profile with the Georgia Gardening Survey Profile, it is important to note that the Georgia survey polled homeowners only. The average age of the Georgia Survey respondent was 47 years. The

Exhibit 1. Summary of Survey Implementation

Contacts Attempted	Number of Respondents	Category (%)	Subtotals & Total (%)
Eligible Households¹			
Completed interviews	400	36.5	13.2
Partial interviews	0	0.0	0.0
Refusals	424	38.7	14.0
Non-homeowner	271	24.7	9.0
Total	1,095	99.9	36.2
Determined Not Eligible			
Phone number not working/changed	352	37.2	11.7
Business	321	33.9	10.6
No appropriate respondent	274	28.9	9.1
Total	946	100.0	31.4
Status Unknown			
No answer/busy	463	47.4	15.3
Answering machine	278	28.4	9.2
Strange noise	230	23.5	7.6
Wrong number	6	0.6	0.2
Total	977	99.9	32.2

¹Cooperation rate is the sum of completed interviews, plus non-homeowners willing to complete interview.

Exhibit 2. National, Georgia, and Gardening Survey Respondent Profiles

Homeowner and Household Characteristics	National Residents ¹	Georgia Residents ²	National Gardening Survey ³	Georgia Gardening Survey ⁴
Median Age	40	34	Not available	47 ⁵
Gender (%)				
Male	49	49	48	39
Female	51	51	52	61
Education (%)				
High school or less	50	54	53	30
Some college, college graduate	42	39	47	57
Postgraduate	8	7	Not available	13
Gross Household Annual Income (%)				
Median, in dollars	38,885	38,665	Not available	Not available
<\$50,000	63	Not available	77	41
\$50,000-\$75,000	18	Not available	11	32
>\$75,000	18	Not available	12	27
Location (%)				
Small city/suburb	Not available	Not available	17	55
Rural	25	37	23	17
Large city	75	63	41	15
County/outside town	Not available	Not available	19	10
Farm	Not available	Not available	Not available	3

¹U.S. Census Bureau 1998.
²U.S. Census Bureau 1998.
³National Gardening Survey 1998-1999—all residents.
⁴Georgia Gardening Survey 1999—homeowners only.
⁵Average age.

National Gardening Survey showed the age range of 30-49 years as having the highest number of gardeners (42 percent). This indicates the average age is likely to be similar to that of the Georgia survey respondents.

According to both surveys, gardeners are typically women. The National Gardening Survey results indicated a slightly higher female (52 percent) to male (48 percent) ratio. These percentages reflect closely the profile of national residents (49 percent male, 51 percent female) and are probably due to the fact that the national survey included all residents. The Georgia Gardening Survey showed a greater female/male ratio than the national figures. According to the Georgia Survey, which is comprised of homeowners only, 61 percent of respondents were female and 39 percent were male.

In comparing the educational levels of respondents answering either survey, the Georgia gardeners were on average better educated than

national gardeners. Again, this is because the Georgia survey sample was limited to homeowners. People who have received at least some college education tend to earn a greater income than those with just a high school diploma. Earning a greater income allows a person the opportunity to buy a home. Seventy percent of Georgia survey respondents have attended some college, earned a college degree, or completed postgraduate work, as opposed to 47 percent of national survey respondents who have achieved this level of education. Georgia gardeners also have considerably more education than the average Georgia resident. Only 46 percent of Georgia residents have attended some college, or attained a college degree, while 70 percent of Georgia survey respondents reported the same education level.

The household gross annual income of Georgia survey respondents is higher than that of national survey respondents because the Georgia survey

sample consisted of homeowners. Fifty-nine percent of Georgia survey respondents reported incomes greater than \$50,000 per household annually, while 23 percent of National Gardening Survey respondents indicated that level of income.

The principal location where survey respondents lived varied considerably between the national and Georgia survey. Forty-one percent of national survey respondents indicated they lived in a large city. Fifty-five percent of Georgia survey respondents indicated they lived in a small city or suburb. The population of the City of Atlanta is 425,200 (Atlanta Regional Commission, 2000), as compared to the 3.75 million in the 20-county metro Atlanta area, where approximately half the state population resides (U.S. Census Bureau, 2000).

For purposes of this article, age, gender, education, income, and location were chosen as the most relevant respondent and household characteristics. Typically, age determines a person's ability

and willingness to learn new ideas. According to a 1993 survey, the average age of a Master Gardener volunteer in the Atlanta program was 49 years. Over 69 percent were female, indi-

cating that gender influenced participation in gardening (Rons & Westerfield, 1993).

Educational attainment predicts a person's ability to understand and process information. Cognitive skills enable people who have received more education to process information more efficiently and induce a change in behavior. Income is related to a person's potential to purchase plants and gardening supplies that can lead to unintended detrimental environmental effects. Most single-family homes are found in suburbs, as confirmed by the survey results, justifying the examination of survey results in terms of location.

The survey contained a series of questions about current gardening practices used by homeowners which were intended as pollution prevention measures.

Earlier studies have also found that these respondent and household characteristics were essential in studying homeowner behavior. Simonetta and Henry (1996) requested similar information in their Household Hazardous Waste Survey for the development of a successful educational program to prevent the improper disposal of household hazardous waste.

Current Gardening Practices

The survey contained a series of questions about current gardening practices used by homeowners which were intended as pollution prevention measures. Three issues were of particular interest: monitoring outdoor pests, use of disease-resistant plants, and whether respondents composted their yard waste. See **Exhibit 3** for a profile of survey respondents practicing P2 in home landscapes.

Monitoring Outdoor Pests

Seventy-three percent of Georgia homeowners indicated they do indeed check for insect pests. Scouting for insect pests is an important element of Integrated Pest Management used by many commercial pesticide applicators (Hubbell, Florkowski, Oetting, and Braman, 1996). Checking for pests allows the applicator to diagnose an infestation and assess the need to apply pesticides.

In the absence of scouting, pesticide applicators tend to spray pesticides on an entire customer landscape as a preventive measure for pest infestation. When the whole landscape is treated, there is a risk of applying more pesticides than needed, which may reduce the population of beneficial insects (i.e., predators or parasites of the pests). In addition, the non-selective action of insecticides kills insects required for pollination.

Use of Pest- and Disease-Resistant Plants

When asked, 37 percent of respondents reported that they use pest- and disease-resistant

Exhibit 3. Profile of Respondents Practicing Pollution Prevention in Home Landscapes

Georgia Homeowner Profile	Do you check your outdoor plants for insect pests?	Do you use pest- or disease- resistant plants?	Do you compost yard waste for use in your yard?
Median Age	48	48	48
Gender (%)			
Male	40	41	45
Female	60	59	55
Education (%)			
High school or less	28	27 ¹	29
Some college, college degree	58	53 ¹	59
Postgraduate	13	18 ¹	12
Annual Income (%)			
<\$50,000	41	43	41
\$50,000-\$75,000	32	31	32
>\$75,000	27	27	27
Location (%)			
Small city/suburb	57	60	52
Rural	16	14	18
Large city	14	12	17
County outside town	9	12	9
Farm	3	3	3

¹Differences across education levels confirmed by statistical test at $\alpha = .10$.

plants. The use of pest- and disease-resistant plants requires knowledge of plants' pest and disease tolerance and involves a search for suppliers that stock these plants. Renovation of a landscape using pest- and disease-resistant plants to replace those plants that are prone to pests and diseases requires a considerable commitment of homeowner resources. In the case of new home construction, a designed landscape plan may incorporate pest-resistant plants from the beginning.

A potential obstacle to the use of pest- and disease-resistant plants is limited information at the point of purchase. Vegetable plants sold at retail outlets are labeled for resistance to pests and disease, while ornamental plants often are not. Therefore, vegetable gardeners have a distinct advantage in quickly adopting this pollution prevention practice.

Composting Yard Waste

For many years, organic gardeners have composted yard trimmings, animal manure, and veg-

etable scraps to produce humus, an organic product that is used both as a soil amendment and as mulch in gardens and on farms. According to our survey, 45 percent of Georgia homeowners indicated they compost their yard waste.

Gardeners compost for a variety of reasons. Some do so because they are environmentally conscious and want to recycle the nutrients in grass clippings. Homeowners also can benefit from cost savings by composting yard waste. A 1996 state law (Georgia Code 12-8-40.2) prohibits yard waste from entering state and county landfills. Therefore, with the scarcity of open, private landfills in urban areas, many waste haulers charge a fee for yard waste pick-up.

Despite this economic incentive, however, less than one half of homeowners practiced composting in their yards. The potential loss to gardeners is substantial because successful gardening in Georgia requires annual addition of organic material to the soils. Without home composting to produce organic material, home gardeners incur the additional expense of buying soil

amendments. According to the National Gardening Survey, 48 percent of southerners purchased soil amendments and mulch in 1998.

Interest in Learning About Pollution Prevention in Gardening

Several questions probed for the homeowner's interest in learning more about pollution prevention and gardening. **Exhibit 4** shows the profile of homeowners who expressed a desire to learn more about gardening in an environmentally friendly manner.

As public concern for the health and environmental effects of pesticide contamination has grown, pest management strategies have shifted emphasis from chemical control to cultural and biological controls. In Georgia, on numerous occasions, the media have reported on the degradation of urban surface water from nonpoint source pollution caused by chemical contamination. For example, an article published in the

Atlanta Journal and Constitution in November 1997 discussed how 18 herbicides and seven insecticides that had been washed off more than 100,000 acres of lawns, roadside, and commercial areas contaminated the Chattahoochee River's tributaries in metro Atlanta. The Chattahoochee River is the drinking water source for much of the city and suburbs.

Knowledge About Alternatives to Pesticides

Sixty-seven percent of survey respondents recognized that there are alternatives to chemical pesticides. As a result of shifting pesticide control strategies, biological controls are now more readily available. Insecticidal soaps, horticultural oils, bacterial products, and even live lady beetles can be purchased at retail outlet stores. Information on their use can be obtained not only from traditional sources such as cooperative extension services, but also from newspapers, magazines, television, radio, and the Internet.

Exhibit 4. Interest in Learning About Alternatives to Pesticides

Georgia Homeowner Profile	Do you know there are alternatives to chemical pesticides?	Would you be interested in learning more about alternatives to chemical pesticides?	Would you be interested in knowing what pest-resistant plants are available?
Mean Age	50	45	46
Gender (%)			
Male	40	38	36
Female	60	62	64
Education (%)			
High school or less	23	29	28
Some college or college degree	61	56	57
Postgraduate	15	14	14
Annual income (%)			
<\$50,000	41 ¹	41 ²	41
\$50,000-\$75,000	33 ¹	32 ²	32
>\$75,000	26 ¹	27 ²	27
Location (%)			
Large city	13	14	14
Small city/suburb	56	58	58
Rural area	17	15	15
County outside town	11	10	10
Farm	3	3	2

¹Differences across income groups were confirmed statistically at $\alpha = .01$.
²Differences across income groups were confirmed statistically at $\alpha = .10$.

Interest in Learning About Alternatives to Pesticides

A great majority (69 percent) of homeowners reported an interest in learning about alternatives to pesticides. The National Gardening Survey shows that 45 percent of households in the South purchased insect controls and chemicals in 1998. This is a 40 percent increase since 1993.

In contrast, 4.1 million U.S. households purchased natural, less toxic pest controls in 1993, while only 1.8 million households purchased these products in 1998. This decrease could possibly mean that gardeners need more information to effectively use these products to reduce pest populations.

Interest in Learning About Pest-Resistant Plants

An even greater number (72 percent) of Georgia homeowners expressed an interest in knowing more about pest-resistant plants. Many vegetables are clearly labeled as to pest resistance. In contrast, flowers, shrubs, and trees are not marked for their resistance to pests. A major educational campaign targeted at nurseries and retail outlet stores is needed in order to make this information readily available to the general public and buyers of ornamental plants.

Concluding Remarks

Results of the survey indicate two clear tendencies among Georgia homeowners and their use of cultural practices: Differences among genders suggest that, whereas women were more likely to scout for pests or use disease-resistant plants, men were more likely to compost organic yard matter. Composting can be physically strenuous; it can also be a cost reduction measure in some communities that regulate backyard waste disposal. The percentage of households reporting yard waste composting was relatively higher in large cities, where the disposal fees are the high-

est, and in rural areas, where the physical effort (loading, transporting, and unloading) needed to dispose the waste at a collection station can be substantial. Educational programs should account for possible gender differences in workshop and seminar participation.

Knowledge was particularly important in choosing pest-resistant plants for landscaping. Respondents with postgraduate education were more likely to choose plants with pest pressure in mind; this finding supports the need for education in this area. Encouraging voluntary labeling of ornamental plant resistance will encourage all homeowners to make better choices.

Respondents' interest in learning about alternatives to pesticides showed opportunities for distinguishing the targeted educational mes-

Knowledge was particularly important in choosing pest-resistant plants for landscaping.

sage. Women were far more interested in acquiring new knowledge about alternatives to pesticides and pest-resistant plants. Respondents with post-graduate education and those from the highest income category showed relatively less interest in learning than respondents with just a college degree or a lower educational attainment level and a gross annual household income of less than \$75,000. In terms of location, households from suburbs and those living in areas near towns were more likely to express interest in learning about pesticide alternatives and plant pest resistance than those in other areas. This outcome was anticipated because homeowners at those locations are likely to own large lots, providing opportunities for landscaping and gardening.

Targeting college-educated, middle-class women from households located in incorporated or unincorporated areas can find a receptive audience. The real challenge is how to reach

others. The role of the cooperative extension service and local newspapers in disseminating knowledge in rural areas will be important; innovative formulation of educational messages will enhance communications.

Homeowners in large cities live mainly in well-established neighborhoods where the existing landscapes contain plants that have survived the selection process. There is often little desire or opportunity to change because mature trees and shrubs dot the landscape.

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