

## Use of Demonstration Gardens in Extension: Challenges and Benefits

### Abstract

Extension agents' use of demonstration gardens was studied to determine how gardens are employed in horticultural programming, perceived benefits and challenges of using gardens for Extension programming, and desired competencies. Gardens are primarily used to enhance educational efforts by providing hands-on learning experiences. Greatest perceived benefits of gardens were their effectiveness as an educational delivery method, as well as their ability to provide opportunities for meaningful volunteer service and facilitate the development of partnerships. Greatest perceived challenges were availability of time, money, and volunteer support. Findings support the use of gardens as an appropriate educational strategy for Extension programming.

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## Introduction

Due to their tangible, real-life nature, gardens can enhance learning in multiple settings (Falk & Dierking, 2000; Borun, 2001), including Extension's educational programs. Gardens provide opportunities for hands-on involvement, enabling the type of sensory, exploratory learning experiences Richardson (1994) recommends for Extension's clientele. In addition, gardens can be a source of the concrete experiences necessary for experiential learning (Kolb, 1984).

Extension agents can use demonstration gardens to enhance learning for multiple audiences within several horticultural programming goals. Workshops that combine a traditional classroom experience with a demonstration site visit increase learning and affect attitude change more so than a classroom experience or site visit alone (Harmon & Jones, 1997). In addition, gardens allow for the use of delivery methods unique to physical sites, such as guided tours and demonstrations, both of which have been promoted as ways to creatively engage learners (Osland, 2006).

When properly designed and interpreted, gardens can support self-directed learning (Price, 1986; Butler & Serrell, 2000; Falk & Dierking, 2000; Hamilton & DeMarras, 2001) that results in both short- and long-term outcomes. These include knowledge gain, increased curiosity, improved skills, problem solving, behavior change, increased confidence, and attitude change (Butler & Serrell, 2000).

Recommendations to enrich learning in gardens and museum-type settings include developing plantings around a theme or "big idea" that guides all aspects of design (Butler & Serrell, 2000); developing gardens in scale with home landscapes and labeling all plant material (Price, 1986); providing informational and self-guiding tour brochures (Price, 1986; Falk & Dierking, 2000); and installing interpretative signs (Price, 1986; Falk & Dierking, 2000). Falk and Dierking (2000) emphasize the need to connect visitors to reinforcing experiences outside of the garden to maintain learning, with interactive websites and printed materials suggested as possible delivery methods.

While research supports the educational effectiveness of gardens, an extensive search of the literature could find no studies of how Extension agents use gardens in their programming. What principles, practices, and techniques are agents employing to enhance their garden's educational effectiveness? Which audiences are served? What are the challenges and benefits of choosing this educational delivery method? Answers to these questions would provide guidance to agents embarking upon garden development as well as to agents seeking to expand or improve existing gardens.

## Purpose and Objectives

The purpose of the study reported here was to investigate how horticulture Extension agents in North Carolina use demonstration gardens in their programming. The study objectives were to:

1. Determine which features, techniques, and practices agents are incorporating into demonstration gardens to enhance their educational effectiveness.
2. Identify the perceived benefits and challenges of choosing demonstration gardens as an educational delivery method for Extension horticulture programming.
3. Identify areas of additional training desired by agents maintaining demonstration gardens.

For the study, a demonstration garden was defined as a landscape or garden planting designed and maintained under the supervision of a horticulture Extension agent for the purpose of teaching horticultural principles and practices as part of an Extension program. This could refer to a single bed planted with one specific theme or a series of gardens designed to teach about many different ideas or practices. School gardens and community gardens were only included in the study if they were directly supervised by Extension and included some demonstration aspect.

## Methodology

The descriptive study was conducted in two parts. The first part, a telephone survey, identified which horticulture agents in North Carolina were maintaining demonstration gardens and collected data about the characteristics of these gardens. The first part established that 35 agents were maintaining 50 different garden sites as part of their Extension programming in North Carolina (Glen, Moore, Jayaratne, & Bradley, 2010).

This article focuses on findings from the second part; a Web-based survey designed to determine how horticulture Extension agents use demonstration gardens in their programs and their perceptions of the challenges and benefits of choosing this educational delivery method. The census study was conducted with the 35 agents identified in the first part of the study, with 30 agents participating. Because the response rate was over 85%, non-response error was not addressed (Lindner, Murphy, & Briers, 2001).

Three, five-point Likert-type scales were used to identify challenges, benefits, and desire for additional training related to demonstration gardens. Reliability of the scales was determined by calculating Cronbach's alpha. Scores for each of the scales were as follows: Challenges, 0.76; Benefits, 0.83; Additional training, 0.86. Descriptive statistics were used to summarize data.

Content validity of the instrument was established by a panel of experts that included a county horticulture agent, the North Carolina Extension Urban Horticulture specialist, and two members of North Carolina State University's Department of Agriculture and Extension Education faculty. Face validity of the Web survey was established by field testing the instrument among Florida horticulture Extension agents currently using demonstration gardens. No problems were revealed during the field test, and no changes were made to the Web instrument.

## Findings

### Garden Use

Agents were asked to indicate how gardens are used in their programming. The most common forms of use were related to supporting educational efforts. All study participants indicated gardens were used to enhance non-formal education efforts,

such as classes and workshops, with 97% indicating that practices and techniques to facilitate self-directed learning are employed. Complete results are listed in Table 1.

**Table 1.**  
Agent Use of Demonstration Gardens, N=30

<b>Use Statement</b>	<b>Number Reporting</b>	<b>Percent Reporting</b>
To enhance non formal education efforts	30	100
To support self-directed learning	29	97
To provide educational opportunities that would not be possible without the gardens (tours, demonstrations)	23	77
To train volunteers	21	70
To build partnerships	20	67
To market Extension	18	60
To conduct research	15	50
To raise funds	13	43
To recruit volunteers	12	40

When agents were asked to indicate specifically how they use gardens to support their educational efforts, the top three responses related to the use of gardens to support hands-on learning by 1) involving audiences directly in the garden's maintenance, indicated by 93%; 2) using the garden during workshops and classes to provide audiences with hands-on experience, 90%; or 3) involving audiences directly in the planning and development of the garden, 83%. Complete results are listed in Table 2.

**Table 2.**  
Garden Use in Support of Non-Formal Educational Efforts, N=30

<b>Use Statement</b>	<b>Number Indicating</b>	<b>Percent Indicating</b>
Audiences are directly involved in the maintenance of the gardens.	28	93
The gardens are utilized during workshops and classes to provide audiences with hands-on experience of the subject matter being taught.	27	90
Audiences are directly involved in the planning and development of the gardens.	25	83
Demonstrations of correct horticultural practices are led by the agent or an expert in the garden.	22	73
Guided tours are provided by the agent or a volunteer.	20	67
Other: Gardens are used to illustrate principles or practices to clients who visit the office seeking advice.	1	3

## Support of Self-Directed Learning

Agents were asked to identify which, if any, of nine features, techniques, and practices drawn from the recommendations of

Price (1986) and Falk and Dierking (2000) they employ to enhance self-directed learning in their garden. Ninety-seven percent reported using at least one technique for this purpose.

The use of plant identification labels, indicated by 87% of respondents, was the most frequently employed technique, followed by the development of gardens around an educational theme, 83%, with food production, water conservation, and plant selection for site conditions the most frequently demonstrated practices in North Carolina Extension gardens. Complete results are listed in Table 3.

**Table 3.**  
Garden Use in Support of Self-Directed Learning, N=30

<b>Use Statement</b>	<b>Number Indicating</b>	<b>Percent Indicating</b>
Plants are labeled for identification.	26	87
Gardens are developed around an education theme.	25	83
Paths are constructed through the gardens to allow visitors access to the plantings.	20	67
Seating areas are provided to give visitors a place to study and reflect.	18	60
Plantings are designed to be in scale with home landscapes.	18	60
Interpretive signage is placed in the gardens to enhance visitor understanding and learning.	16	53
A self-guiding tour brochure is available in the gardens.	10	33
Brochures on gardening topics are available in the gardens.	6	20
Reference materials available online are promoted in the gardens to encourage continued learning based on the garden visit experience.	3	10
No techniques are used to facilitate self-directed learning.	1	3

## Horticultural Principles and Practices Demonstrated

Based upon North Carolina Cooperative Extension's consumer horticulture programming goals, 15 principles and practices agents were likely to demonstrate in gardens were identified. Agents were asked to indicate all principles and practices from this list demonstrated in their garden.

"Food Production" was the most frequently selected principle or practice, indicated by 80% of participants. This was followed by "Water Wise Use/Xeriscaping, and/or Drought Tolerant Plants," all practices aimed at conserving water in the landscape based on plant selection and placement, and "Plant Selection for Site Conditions," both of which were selected by 57% of participants. Complete results are listed in Table 4.

**Table 4.**  
Principles and Practices Demonstrated in Extension Gardens, N=30

<b>Principle or Practice</b>	<b>Number Indicating</b>	<b>Percent Indicating</b>
Food Production	24	80
Water Wise Use, Xeriscaping, and/or Drought Tolerant Plants	17	57
Plant Selection for Site Conditions	17	57

Composting	15	50
Use of Native Plants in the Landscape	15	50
Creating Wildlife Habitat	13	43
Efficient Irrigation Methods	12	40
Storm Water Management	12	40
Use of New or Underused Plants in the Landscape	9	30
Turf Selection or Turf Variety Demonstration	9	30
Plants on Certified Plant Professional Exam	8	27
Landscape Design Principles	8	27

## Audiences Served

Agents were asked to indicate which audiences their gardens serve from a list of audiences commonly targeted by Extension horticulture programming. The top three audiences were home gardeners, indicated by 97% of respondents, Master Gardener Volunteers, 93%, and youth, 77%. Complete results are listed in Table 5.

**Table 5.**  
Audiences Served by Extension Demonstration Gardens, N=30

<b>Audience</b>	<b>Number Indicating</b>	<b>Percent Indicating</b>
Home Gardeners	29	97
Master Gardener Volunteers	28	93
Youth	23	77
Green Industry Professionals	9	30
Teachers	9	30

## Evaluation Methods

When asked how they evaluate the impact the garden has on their program, 33% of participants responded they do not evaluate the garden's impact. Sixty-three percent indicated they evaluated the garden's ability to enhance learning when incorporated into non-formal education efforts such as workshops, classes, and tours, while only 20% indicated they evaluate the garden's ability to facilitate self-directed learning. Results are listed in Table 6.

In response to the question "What methods do you use to evaluate the garden (select all that apply)," 52% indicated "Surveys," while 46% indicated "Interviews." Thirty-two percent of respondents selected "I do not use any evaluation methods." Two agents selected "Other" and specified they use observation as a method of evaluating their demonstration garden.

**Table 6.**  
Garden Impacts Evaluated by Horticulture Agents, N=30

<b>Evaluation Statement</b>	<b>Number Indicating</b>	<b>Percent Indicating</b>
I evaluate the garden's ability to enhance learning when incorporated into workshops, classes, tours, and/or training series.	19	63

I do not evaluate the garden's impact on my horticulture program.	10	33
I evaluate the garden's ability to enhance self-directed learning of individuals who visit the garden.	6	20

## Challenges

A Likert-type scale consisting of 12 challenge statements related to developing, maintaining, and using demonstration gardens as part of Extension programming was developed by the lead author. To determine the impact each of these challenges had on agents' ability to develop, maintain, and use demonstration gardens, agents were asked to rate each statement as follows: No Impact (1), Very Little Impact (2), Little Impact (3), Some Impact (4), or High Impact (5).

Seven of the 12 challenge statements averaged ratings of at least 4.0, "some impact," or higher. The challenge found to have the highest impact was "Time to manage the gardens" (4.57), followed by "Availability of funds" (4.50). Another time-related challenge, "Time to plan and develop the garden," ranked third (4.43), while "Support of Master Gardener Volunteers" (4.37) and "Availability of volunteers to work in the garden" (4.36) ranked fourth and fifth, respectively. Complete results are listed in Table 7.

**Table 7.**  
Agents' Perceptions of the Challenges of Demonstration Gardens, N=30

Challenge Statement	Mean	SD
Time to manage the gardens.	4.57	0.63
Availability of funding.	4.50	0.64
Time to plan and develop the garden.	4.43	0.79
Support of Master Gardener Volunteers.	4.37	1.08
Availability of volunteers to work in the garden.	4.36	0.91
Availability of land to develop the garden.	4.14	1.11
Support of the County Extension Director.	4.11	0.96
Community partners who will support the garden.	3.74	0.98
Time to evaluate the garden's outcomes and impacts.	3.63	1.15
Knowledge of techniques to evaluate the garden's outcomes and impacts.	3.59	1.15
Support of county government.	3.57	1.23
Support of Extension administration.	2.93	1.27
1 = No Impact, 2=Very Little Impact, 3=Little Impact, 4=Some Impact, 5=High Impact		

## Benefits

A Likert-type scale consisting of 10 value statements related to the benefits of using demonstration gardens in horticultural programming was developed by the lead author. Agents were asked to indicate their level of agreement with each value statement as follows: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), or Strongly Agree (5). Negative statements were reverse coded.

Seven of the 10 statements averaged 4.0, "agree," or higher. The highest rated value statement was "The gardens increase the effectiveness of my Extension program" (4.45), followed by "The gardens provide meaningful opportunities for

volunteer service" (4.38). "Demonstration gardens are not an effective tool for teaching horticulture," a reverse coded item, had third highest average rating, 4.31, indicating agents perceive gardens to be an effective educational delivery method for teaching horticulture. Complete results are listed in Table 8.

**Table 8.**  
Agents' Perceptions of the Value of Demonstration Gardens, N=30

Value Statement	Mean	SD
The gardens increase the effectiveness of my Extension program.	4.45	0.57
The gardens provide meaningful opportunities for volunteer service.	4.38	0.62
* Demonstration gardens are not an effective tool for teaching horticulture.	4.31	0.85
Visitors learn when they walk through the gardens.	4.24	0.69
The gardens provide valuable opportunities for partnerships and collaborations in the community.	4.07	0.70
My classes and workshops are more effective because of the gardens.	4.07	0.75
I would recommend the development of demonstration gardens to other agents.	4.00	0.85
Developing and maintaining demonstration gardens is an efficient use of program resources.	3.90	0.82
The gardens attract people to my Master Gardener Volunteer program.	3.79	0.74
More people attend programs because of the gardens.	3.62	1.01
1 = Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree * Reverse coded item.		

## Desire for Additional Training

A Likert-type scale consisting of nine competencies required to develop, maintain, and use demonstration gardens as an educational delivery method for Extension horticulture programming was developed by the lead author. Agents were asked to indicate their level of desire for training on each competency as follows: No Desire (1); Little Desire (2); Moderate Desire (3); High Desire (4); and Very High Desire (5).

The only competency with an average rating higher than 4.0, "High Desire," was "How to evaluate the garden's outcomes and impacts" (4.17). Competencies for which agents had the least desire for additional training were "Garden installation" (2.69) and "Garden maintenance" (2.76), which were the only training topics achieving an average rating below 3.0, "Moderate Desire." Complete results are listed in Table 9.

**Table 9.**  
Agents' Desire for Additional Training, N=30

Training Topic	Mean	SD
How to evaluate the garden's outcomes and impacts.	4.17	1.07
How to develop and manage the garden to support self-directed learning.	3.62	1.15
How to raise and manage funds.	3.46	1.07
How to recruit and manage garden volunteers.	3.45	0.83
How to utilize the garden to support non formal education efforts such as classes and workshops.	3.31	0.93

How to plan and design gardens for educational use.	3.24	0.95
How to develop community partnerships.	3.17	0.89
Garden maintenance.	2.76	1.02
Garden installation.	2.69	0.93
1 = No Desire, 2=Little Desire, 3=Moderate Desire, 4=High Desire, 5=Very High Desire		

## Discussion and Implications

The findings of the study reported here support the use of demonstration gardens as an appropriate educational delivery method for Extension's horticultural programming. Study participants perceived that gardens are an effective tool for teaching horticulture. This corresponds to findings that involvement in gardens and site visits enhance learning (Borun, 2001; Harmon & Jones, 1997; Wilson, Minton, Mecca, & Gersony, 2004; VanDerZanden & Cook, 1999).

Gardens were used primarily to support educational efforts by providing opportunities for hands-on involvement with subject matter, as promoted by Richardson (1994) and Kolb (1984). In addition, all but one agent reported incorporating features, techniques, and practices such as plant labels, interpretive signage, and self-guiding tour brochures to enhance self-directed learning.

Of nine possible features, techniques and practices recommended to support self-directed learning, two were found to be employed by more than 80% of participants, with labeling of plant material the most frequent. This practice was reported by Price (1986) as the feature most commonly sought by garden visitors. The second most frequently employed practice, developing gardens around an educational theme, has been shown to be an important and effective strategy to enhance self-directed learning (Price, 1986; Butler & Serrell, 2000; Falk & Dierking, 2000).

Learning how to develop and manage gardens to support self-directed learning was the second highest rated competency for which agents desired additional training. Considerable scope for enhancing the ability of Extension gardens to support self-directed learning exists, particularly practices that encourage learning beyond the garden visit experience. Only 20% of agents reported having subject matter-related brochures available in their gardens, though Price (1986) reported high interest in such brochures. Fewer were found to link the principles and practices taught in the garden to resources available online, a practice promoted by Falk and Dierking (2000) as necessary for sustaining learning.

Gardeners are most likely to visit gardens to learn about plants, gardening techniques, and garden design principles (Price, 1986; Hamilton & DeMarras, 2001). The principles and practices agents are demonstrating in gardens align with these learning goals. Food production techniques, design and plant selection for water conservation, and plant selection for site conditions were the most frequently demonstrated horticultural principles in Extension gardens. Audiences most frequently targeted by this educational delivery method were homeowners, Master Gardeners, and youth. These target audiences and learning outcomes align with those frequently found in Florida Extension demonstration gardens (Brown, Taylor, & Eubanks, 2007).

Agents were more likely to evaluate the garden's ability to enhance classes and workshops as compared to self-directed learning, though a third of respondents reported they do not evaluate any impact the garden has on their programming. How to evaluate garden outcomes and impacts was the highest ranked competency for which agents desired additional training, indicating they are aware of the need for evaluation but are unsure how to accomplish it.

Evaluating the type of learning that takes place in gardens, museums, and nature centers is an emerging field (Lord, 2007). Butler and Serrell (2000) have shown that short- and long-term knowledge gains can result from garden visits and that these experiences have the potential to influence visitor's knowledge, attitudes, and future behaviors. Falk and Dierking (2000) recommend that visits to museums and related sites be evaluated as reinforcing experiences, valuable for their ability to reaffirm knowledge for long-term learning. Lord (2007) emphasizes the value of site visits for sparking interest in a subject as well as for affecting attitude change, an outcome supported by the findings of Harmon and Jones (1997).

Agents rated the availability of time, funding, and volunteer support as the greatest challenges to using demonstration gardens, while also ranking the garden's ability to provide opportunities for meaningful volunteer service as the second

highest among benefits of using gardens. Findings from the first part of the study identified Extension Master Gardeners as the primary source of funding and labor for demonstration gardens.

It has been shown that Extension Master Gardeners anticipate involvement in gardens as part of their volunteer service (Mayfield & Theodori, 2006). Involving Extension Master Gardeners in the planning, development, maintenance, and funding of demonstration gardens can help agents overcome the challenges of limited time and funding, while providing these volunteers with the hands-on learning experiences they have been shown to value (Schrock, Meyer, Ascher, & Snyder, 2000; Moravec, 2006).

While the value statement, "The gardens increase the effectiveness of my Extension program," ranked highest among 10 possible benefits of using gardens, other highly ranked value statements related to the garden's ability to provide opportunities for volunteer service and to develop community partnerships and collaborations.

The establishment of collaborations and partnerships and utilization of volunteers to extend educational reach have both been identified as sources of excellence for Extension (Archer, Warner, Miller, Clark, James, Cummings, & Adamu, 2007).

## Conclusions and Recommendations

Demonstration gardens are an effective educational strategy for teaching horticultural principles and practices to Extension audiences, particularly homeowners, Master Gardeners, and youth.

- Before beginning a garden project, consider and plan for the time and resources that will be required. Volunteer and community support is essential. Investing and engaging potential volunteers and community partners from the beginning will benefit the entire Extension program.
- Develop gardens around educational themes that align with the goals and objectives of the Extension program. Popular themes include food production, water conservation, and right plant, right place. Help audiences connect to existing additional learning resources such as print and online publications.
- Incorporate as many practices supportive of self-directed learning as possible, especially labeling of plant material. Develop subject matter brochures and Web resources to provide visitors further learning and reinforcement opportunities beyond the garden visit.
- Incorporate garden experiences into classes and workshops. Encourage participants to reflect on their garden experience, draw conclusions, and experiment with their new knowledge to complete the learning cycle. Be creative, and use multiple methods for involving audiences including tours, demonstrations, and hand on experiences.
- Gain necessary skills for evaluating demonstration gardens, and develop a framework for evaluating the full impact gardens have on the Extension program, including volunteer service and community partnerships. When evaluating educational outcomes, focus on attitude change and the garden's ability to reinforce learning.

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These findings are from a larger study conducted for a master's thesis. In addition to investigating how agents' utilize gardens for educational programming and their perceived benefits and challenges, the study also identified the physical and management characteristics of Extension demonstration gardens in North Carolina. The complete thesis is available online from the NCSU libraries at <http://www.lib.ncsu.edu/resolver/1840.16/6483>.

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