CLEMSON UNIVERSITY

Onward & Upward:

Filling the Hunger Gaps with Vertical Farming

Malisia Wilkins

3/30/2013

Have you ever gone hungry? I don't mean you skipped breakfast and lunch is long past due. Think of hunger more in terms of, you can't remember the last time you ate. Many people throughout the world suffer from an inability to obtain healthy, nutritious foods, specifically fresh fruits and vegetables. In the United States, communities have come together to help feed those in need through the establishment of community gardens, community supported agriculture, and farmers' markets. These agricultural programs are designed to help support small local farmers, and bring much needed fruits and vegetables to areas that would otherwise have none. The intent of this literature review is to give a brief overview of food insecurity in the United States, examine the impact local community agriculture has on feeding the hungry, and propose how vertical farming can fill the hunger gaps.

Food security is not a new concept. *Food security* as defined by The United States Department of Agriculture is, "access by all people at all times to enough food for an active, healthy life" (USDA, March, 2012). Throughout the world there are geographic locations referred to as 'food deserts.' Places where due to lack of access, land, money, or transportation some people are not able to eat, or feed their children on a regular basis (USDA, March, 2012).

The rules that define food security are known as the "5 A's of food security" and encompasses the following:

(1) Availability: sufficient food for all people at all times

(2) Accessibility: physical and economic access to food, including access to information

(3) Adequacy: access to food that is nutritious, safe, and sustainable

(4) Acceptability: access to culturally acceptable food production and distribution that do not create conflict with people's dignity or human rights

(5) Agency: policies and processes that help achieve food security (Meenar, 2011, p 14).

Almost 15% of all households in the U.S. were food insecure at least some time during 2011, almost 6% with very low food security—meaning that "the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources for food" (USDA, March, 2012). It should be noted that although not within the scope of this literature review, faith-based organizations, food banks, and emergency food services provide much needed assistance to countless communities across the country. See Appendix A for accompanying charts.

Community programs helping to re-localize food and feed the hungry

Community Supported Agriculture (CSA): The United States Department of Agriculture says that community supported agriculture (CSA) "consists of a community of individuals who pledge support to a farm operation so that the farmland becomes, either legally or spiritually, the community's farm, with the growers and consumers providing mutual support and sharing the risks and benefits of food production" (USDA, 2013). Most CSA's operate by selling shares of the expected harvest, and each share holder is given a portion of the harvest in return.

Although CSA's work to supply communities with fresh local produce, their concentration is not necessarily on low-income individuals with food insecurities, that need more nutritious foods to promote good health. Having access to fresh produce does not equate to it being affordable to low-income families, particularly in urban areas where farms are usually located a driving distance away. In order for CSA's to be a more viable option for low-income consumers it is necessary for them to consider taking electronic benefit transfer cards (food stamps), so that families receiving benefits can afford to buy shares.

Community gardens: The Meenar study of 2011, a collaborative between the Center for Sustainable Communities at Temple University and the Pennsylvania Green Growth Partnership, was conducted in Philadelphia's lower-income neighborhoods in 2010 and 2011. The study had two primary objectives: Analyze food security issues, and hunger in the city of Philadelphia, and analyze the contribution of community gardens, community based organizations, and community development corporations in providing fresh food access, and alleviating food insecurity. They found: The viability of a community garden depends on the area and the number of volunteers dedicated to making it work, and "hundreds of community gardens have died over the last two decades for a myriad of reasons" (Meenar, 2011, p 14). Community gardens are also seasonal, and may not produce year-round. Community gardens are dependent on funding from state, and/or local funding, and require volunteers with gardening experience. The study noted that while it is important to create knowledge about the availability of local produce, the most important aspect to consider is that the knowledge is being shared with a "generation that is unfamiliar with the production of food" (Meenar, 2011, p 6). This sheds some light on the difficulties currently felt by many organizers of community gardens. How can they expect the underserved to participate when these individuals have little to no knowledge or understanding of how the food system works?

They also noted that while there are a dozen garden sectors, each sector located in the neediest locations, many volunteers seem to come from surrounding areas, and not necessarily from the neighborhoods where the gardens are located (Meenar, 2011, p 25). Gardens are currently located throughout Philadelphia, located mostly in the areas of highest need. A chart of Philadelphia's garden locations, and areas of need surveyed for the Meenar

study is located in Appendix B. This chart shows a wide distribution of gardens in needy areas, but it also shows that some of the areas with the greatest food scarcities are lacking in the number of gardens needed to serve the food insecure.

Community gardens could be a great outlet for educating the public about our food system and give many people a better understanding of producing their own food. Organizing, funding, and producing a viable community garden is difficult at best. Many organizers feel as though their volunteer work is more like a full-time job. Community gardens require a broad cross-section of the community to participate, and it is essential for the project to be representative of the community and contribute to the growth of a community food system in order to be successful (Garret, p 6).

Farmers' markets: "Farmers markets are an integral part of the urban/farm linkage and have continued to rise in popularity, mostly due to the growing consumer interest in obtaining fresh products directly from the farm" (USDA, 2012). Farmers' markets give consumers the opportunity to have a better understanding of where their food comes from, and it helps farmers stay financially viable. It is also aiding in the economic boom being felt by small organic farmers throughout the country, making these markets more mainstream (USDA, 2012). The rapid growth of markets will surely bring produce to areas that need it, but availability does not equal affordability. Many low-income families are forced to buy the cheapest foods in order to survive. This doesn't mean that you can't find good quality produce at a reasonable price at your local farmer's market, but opinions vary on what is considered a reasonable price.

Vertical Gardens: Small-scale vertical farming is one method that could help nourish needy families, as well as educate them about food production. Vertical farming, started and

patented by Patrick Blanc, is a simple means of growing, using a technique that allows for vertical growth. It is based on a simple structure that does not require soil. This method requires “a structure consisting of a vertical surface covered in felt, which replaces the soil and retains water” (Blanc p. 97). Vertical gardens are ideal for people living in the urban environment, or without land for crops.

Vertical farming has been used in commercial settings and residential settings alike, but there is very little information to be found about vertical farms being used to feed the hungry. Small, vertical garden structures that are mobile and easy to move can be hung on the exterior wall of a house, or leaned against an apartment building. Using this method, people would be able to grow fruits and vegetables for themselves with very limited space, and knowledge.

Conclusion: Due to an increase in food insecurities, and a decrease in available funding, volunteers, and land, we have found that more research in small vertical farming, to combat urban food insecurities, is necessary in order to provide low-income families with basic nutritional requirements. We believe that by educating individual families, to produce on a micro-scale, we can work to eliminate food insecurities, and hunger. Based on our findings, all community programs provide access to food for people that are at risk of food insecurities, as well as help to keep small farmers in business, and promote local organic production. Because the need for nutritious food is so great, and the gaps in healthy food availability and education to low-income individuals and families we have decided to proceed with developing our vertical pallet garden prototype, in the hope that we can help increase food security, and educate families to produce their own food.

Vertical Garden Prototype Design and Justification

In designing our vertical garden, we wanted to ensure that it would be:

- Sustainable, and made from organic, up-cycled, and/or recycled materials
- Inexpensive to build
- Easy to use for individuals with little to no farming experience
- Little to no maintenance for vegetable production
- Easy to move for better production quality
- Minimal outdoor space requirements for vegetable production
- Enough yield to provide supplemental nutrition for low-income families
- An educational tool to demonstrate food production

When it came to designing the vertical garden, our first priority, beyond feeding people, was sustainability; our second priority was to design something inexpensive, and easy to build. This compromise led us to use pallets rather then building our own structure, and thanks to Ace Hardware in Clemson, we have plenty of pallets at no cost. They are reasonably lightweight, versatile in regards to placement, and can be teaching aids for those with little or no gardening experience, while supplying the food insecure with supplemental nutrition.

A simple search of the internet on March 30, 2013 turned up 1.7 million results for "vertical pallet garden" including, videos, blogs, and do-it-yourself websites. Having extensive material available made it much easier to decide on methods for construction, but it didn't make it any easier for us to find desirable materials to build our prototype. The following is a

list of materials that we needed for completion of our first prototype, as well as how we found and procured the materials.

Structure: Our vertical pallet garden will be assembled using an up-cycled pallet, donated by Ace Hardware in Clemson, SC.

Medium: After researching Patrick Blanc's patented system, we were able to find a group at the Vertical Garden Institute that were testing his trademark design to share the basics of vertical farming with others. They found that using a mix of topsoil, peat, and pearlite retained moisture well, and provided a light, airy mix (Vertical Garden Institute).

Backing: This proved to be more difficult. After looking into different options for the backing of our garden, we decided we wanted to use hemp based capillary mats. These mats were able to not only hold excess water, but also release it when additional moisture is needed. We originally found the product we wanted to use through a Canadian distributor, but after several emails and phone calls we were unable to make direct contact. This could be due in part to the controversial nature of hemp products, but also due to the cost. We refused to give up the search and decided to compromise by sourcing heavy duty capillary mats, but the cost to purchase these items would have made it impossible to produce at a low enough cost to aid the low-income individuals that would benefit from our garden.

In the end, we decided to use materials that could be found in any home improvement store, and could be purchased at a lower cost; this will make it easier for others to duplicate our design. For the fabric backing we purchased a roll of *Dupont Weedfree Moisture Plus Fabric* from Lowe's. Unlike other landscape fabric, this particular option provided some water retention, and release capabilities at a much lower cost than the desired capillary mats. We

were able to purchase a roll that would cover 150 square feet for $20.00. We also chose to use hardware net (aka deer fence) to help hold the soil in place and provide more support during watering, and transport. The roll of hardware net was also purchased at Lowe's for $14.00, and comes in a roll that covers 540 square feet. At the current rate of use we are anticipating the amount of fabric and hardware net purchased will allow us to build 8 full size pallet gardens, or 16 half size pallet gardens.

Paint: Ensuring the gardens are aesthetically pleasing helps to promote use. People are much more likely to care for things they appreciate. Since pallets are far from aesthetically pleasing we wanted to be able to dress them up and make them more appealing. To accomplish this, on a budget, we looked into making our own natural, organic paint, but during our search we discovered a company that had already mastered the art of organic paints. The Old Fashioned Milk Paint Company has been producing chemically safe paints since 1974, and "is now gaining an even wider usage because it contains only ingredients that are all-natural and will not harm the environment" (Milkpaint.com). Founder, Charles Thibeau, published one of the earliest sourcebooks of environmental systems with his non-profit organization the National Foundation for Environmental Control. A few years later he created his signature Milk Paint.

We immediately contacted Milk Paint to inquire about their product, and we were ecstatic that they were willing to send us the paint we needed at no charge. Of course, this may not be an option for families in need that are looking to construct their own pallets, however You can find the letter of inquiry sent to Milk Paint, as well as contact information in Appendix C.

Plants: When it came to plants we had to not only find plants that could grow with minimal effort, but also plants that were able to grow at shallow soil depths. More importantly, we wanted to use plants that would be desirable to varying cultures and provided adequate supplemental nutrition. To keep costs low, we started all of our plants from seeds. Seeds are readily available at most home improvement stores, and can be purchased with easy-to-use peat starter cups which are great for beginner gardeners.

Due to our current season, spring, and limited availability we chose cilantro, bell peppers, Italian parsley, kale, basil, sweet marjoram, oregano, chard, micro-greens, lettuce, strawberries, and thyme. These items will provide nutrient rich leafy green vegetables, and fresh herbs for cooking, which also provide great nutritional value, and health benefits. Additional information regarding the benefits of individual plants, and a step-by-step guide to vegetable gardening can be found in Appendix D.

We started our seeds in mid February, and kept them indoors, but due to an unusually long cold spell through March we were not able to get a sufficient number of plants for our pallet gardens. Thankfully, the South Carolina Botanical Garden had extra vegetable plants that they gave us free of charge. A few additional items had to be purchased from a local garden center in order to fill the pallets.

For additional information and photos of our project please see Appendix E.

Work Cited

Blanc, Patrick. (2012). *The vertical garden: from nature to the city*. W. W. Norton & Company.

Garrett, Steven & Feenstra, Gail. (Not dated). *Growing a community food system.* Retrieved from http://smallfarms.wsu.edu/wsu-pdfs/WREP0135.pdf

Glaser, Lawrene. (May, 2012). *Provisions of the Food Security Act of 1985.* United States Department of Agriculture, Economic Research Service. Retrieved from http://www.ers.usda.gov/publications/aib-agricultural-information-bulletin/aib498.aspx#.UVcAwBesiSo

Haering, Stephen A. MD, MPH & Syed, Shamsuzzoha B. MD, MPH, DPH. (2009). *Community food security in United States cities: A survey of the relevant scientific literature.* Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health. Retrieved from http://www.jhsph.edu/sebin/s/c/FS_Literature%20Booklet.pdf

Meenar, Mahbubur & Hoover, Brandon. (October, 2011). *Food insecurity and spatial inequality in Philadelphia's lower-income neighborhoods: Analyzing the role of community gardens.* Center for Sustainable Communities, Temple University. Retrieved from http://www.temple.edu/ambler/csc/newcsc/research/projects/documents/Food_Insecurity_Oct2011.pdf

The Old-Fashioned Milk Paint Company, inc. (Not dated). *Just because you're green doesn't mean you have to be drab.* Retrieved from http://www.milkpaint.com/images_press/1-Introduction.pdf

United States Department of Agriculture (USDA). (March, 2013). *Community Supported Agriculture.* Alternative Farming Systems Information Center. Retrieved from http://www.nal.usda.gov/afsic/pubs/csa/csa.shtml

United States Department of Agriculture (USDA). (December, 2012). *Farmers markets and local food marketing.* Agricultural Marketing Service. Retrieved from http://www.ams.usda.gov/AMSv1.0/farmersmarkets

United States Department of Agriculture (USDA). (March, 2012). *Definitions of food security.* Retrieved from http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx

Vertical Garden Institute (VGI). (2013). *The basics.* Retrieved from http://verticalgardeninstitute.org/lessons-learned

Appendix A: Food Security

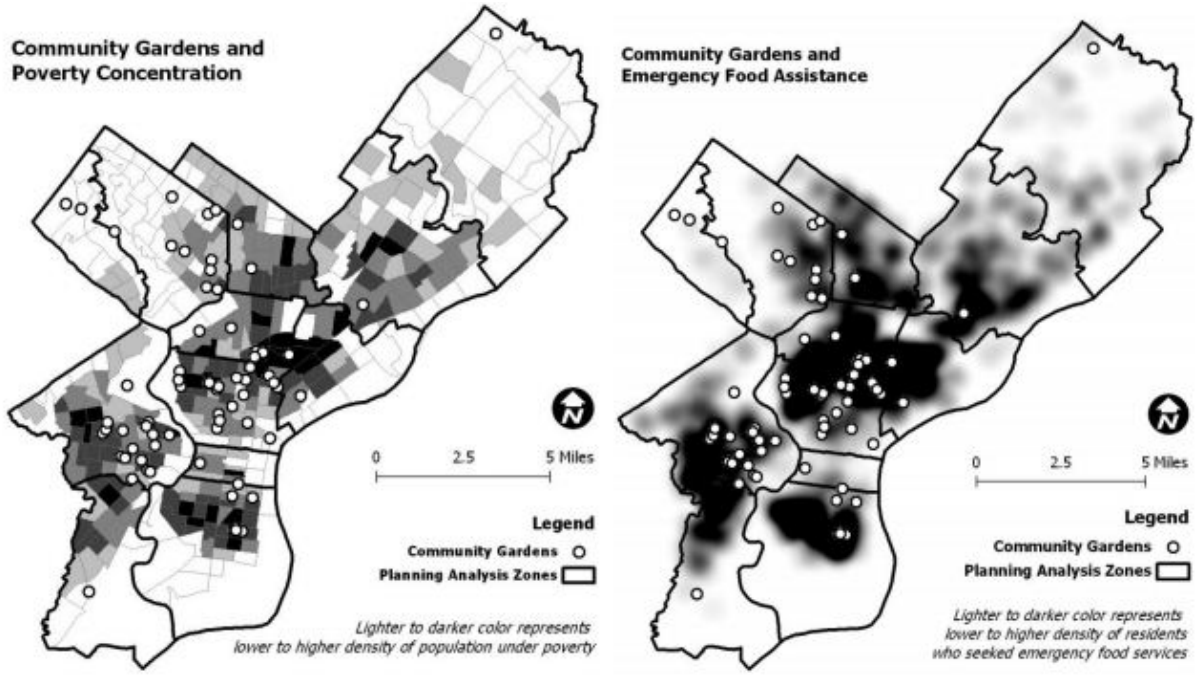
Percentage of households reporting indicators of adult food insecurity, by food security status, 2011

Source: Calculated by ERS using data from the December 2011 Current Population Survey Food Security Supplement.

ERS

http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx#.UVcuwResiSo

Appendix B: Meenar Study



http://www.temple.edu/ambler/csc/newcsc/research/projects/documents/Food_Insecurity_Oct2011.pdf

Appendix C: Letter to Milkpaint & Contact

Good morning,

My name is Malisia Wilkins and I am a student at Clemson University in South Carolina. I am currently working with another student to design and build a mobile vertical garden for low-income families in the urban environment. The vertical garden will be constructed using up-cycled pallets and will enable low-income families to produce their own food with minimal space and maintenance. I am contacting you today in hopes of obtaining several samples of your Milk Paint.

Originally, our intent was to create our own organic paint to make the vertical garden feel more like an "edible art installation." After stumbling upon your website, however, we would prefer to use Milk Paint as our sole, reputable source of organic paint. In return, Milk Paint will be highlighted throughout our literature review, design, prototype and presentation. We will be happy to include any information you find suitable for our request.

If possible, we would like to have at least 3 to 5 different color samples to test a variety of options for aesthetic appeal. Also, since we are using pallets, we are unsure of exactly how much paint we will need due to varying absorption rates and would greatly appreciate any advice you could give in regards to the quantity we might need. We are scheduled to begin building our prototype the second week of March and therefore would love to speak to someone by phone, as soon as possible. Please let me know the ideal person to speak to about our project, so I can make phone contact this coming week.

We sincerely appreciate your consideration. As students, we have the desire and motivation to make great things happen, but rarely do we have the funding to see it through to completion. We hope you will consider helping us make our goal a reality. Thank you so much for your time and consideration. If you have any questions, or would like more information about our project, please feel free to contact us at anytime. We have included our professor, Dr. Ellen Vincent, on this correspondence as well should you have questions for her. Thank you again and we look forward to using your products.

CONTACT

THE OLD FASHIONED MILK PAINT CO., INC.
436 Main Street
Groton, Massachusetts 01450

PHONE (978) 448-6336
TOLL FREE (866) 350-MILK (6455)
FAX (978) 448-2754

Contact	Email
Anne Thibeau - President	anne@milkpaint.com
Cora Tofferi - Questions	cora@milkpaint.com
Terri Senecal - Sales	terri@milkpaint.com
Website Related Questions	webmaster@milkpaint.com

To ensure a quick response, please be sure to enter a subject in the header of your e-mail message or it may be accidentally deleted as junk mail. Thank you.

Appendix D: Plant Profiles

Common name: Oregano

Latin name: *Origanum vulgare*[12]	**Texture**: Fine[19]
Common names: Oregano[12] Mediterranean oregano[19]	**Growth rate**: Medium[12]
Flowers: Showy, pink, white[12]	**Light:** Full sun[12]
Fruit: Inconspicuous[19]	**Moisture:** Low to medium[12]
Height & Width: 12”-18”x 12”-18”[12]	**Soil*:** Soil PH: 6.0-9.0, Ideal 6.0-8.0[19]
Type: Herbaceous perennial[12]	**Zones**: 4-8[12]
Habit: Sprawling[12]	**Origin:** Europe[12]
Wetland indicator category:** [17]	**Benefits:** Drought and deer tolerant[12]

(Numbers identify sources listed on page 2-3)

Features: Oregano is an herb that is grown almost exclusively for culinary use, and features pungently aromatic, flavorful, oval, dark green leaves. Clip fresh leaves as needed or dry them for year-round use. Tiny, white to rosy pink flowers appear throughout the summer. Oregano is drought and deer tolerant[12].

Siting: Primarily grown in the herb or vegetable garden. For ornamental value, there are a number of *Origanum* hybrids and *O. vulgare* cultivars which display showier flowers and/or more colorful foliage. Oregano can also be used for erosion control[12].

Care*:* Oregano prefers to be planted in well-drained soil. It is pretty low maintenance as long as it has well-drained soil and sun. It pretty much looks after itself[12].

Pests: Soil must be well drained or root rot will be a big problem[19].

This plant does not appear on the following invasive plant lists on (3/18/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: Sources: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/e420/origanum-vulgare.aspx

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/5640-oregano-mediterranean-oregano/guide/overview

Common name: Sweet basil

Latin name: *Ocimum basilicum*[12]	**Texture**: Silky[21]
Common name: Sweet basil[12]	**Growth rate**: Medium[12]
Flowers: Showy[12], purple, edible[21]	**Light:** Full sun[12]
Fruit: Small, round, white[21]	**Moisture:** Medium[12]
Height & Width: 18-24"x18-24"[12]	**Soil*:** Moist, rich, well-drained soils[12], pH range of 5.5- 6.5[21]
Type: Annual[12], Forb/herb[16]	**Zones**: 2-11[12]
Habit: Upright[18]	**Origin:** Tropical Asia to Africa[12]
Wetland indicator category:** Not available[17]	**Benefits:** Medicinal properties, used as sedative and for nausa[21]

(Numbers identify sources listed on page 2-3)

Features: Basil has a mildly peppery flavor with a trace of mint and clove. It is an annual herb belonging to the mint family, and like others in this family, basil can be identified by its square, hairy stems[21]. Herbalists have recommended basil for years for stomach cramps, vomiting and constipation. Basil has been described as having a slight sedative action, which would explain why it is sometimes recommended for headaches and anxiety[21].

Siting: Sow seeds in early spring. Basil grows best in full sun in moderately rich and well-drained soil. Pinch out centers to encourage bushy growth; as frost approaches, root cuttings in water and pot for winter use[12]. Basil can be used in the herb garden, flower garden, as borders plants, in containers, raised beds, and in hanging baskets[21].

Care*:* Basil is easily grown from seed, started indoors or outside in the garden after the danger of frost has passed. It is very tender and sensitive to frost injury. For indoor culture, sow seeds in a flat, and cover them with a moistened, sterile mix to a depth not more than twice the size of the seed. Space seeds 3/8 to 1/2 inch apart in the flat. Maintain a soil temperature of approximately 70 degrees F. Once germination begins, at 5 to 7 days, the plantlets must be kept warm at 70 degrees F or above and the soil must be kept moist. When seedlings have at least 2 pairs of true leaves, transplant them to 2 inch pots[21]. Fertilize basil sparingly because it decreases the fragrant oils[21].

Pests: Basil may be skeletonized by Japanese beetles. To control, remove beetles by hand[12].

This plant does not appear on the following invasive plant lists on (3/10/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a689/ocimum-basilicum.aspx

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA*. Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/2791-basil-basil/guide/overview

(20) University of Minnesota Extension. (2013) Retrieved from http://www.extension.umn.edu/distribution/horticulture/M1221.html

(21) Ohio State University Extension. (2008) Retrieved from http://ohioline.osu.edu/hyg-fact/1000/1644.html

Common name: Thyme

Latin name: *Thymus vulgaris*[12]	**Texture**: Fine[19]
Common name: Thyme, English thyme[12]	**Growth rate**: Medium[12]
Flowers: Showy, purple[12]	**Light:** Full sun[12]
Fruits: Inconspicuous[19]	**Moisture:** Low[12]
Height & Width: 6”-12”x 6”-12”[12]	**Soil*:** Soil PH: 6.5-8.5, Ideal 6.5-7.0[19]
Type: Herbaceous perennial[12]	**Zones**: 5-9[12]
Habit: Upright[12]	**Origin:** Southern Europe[12]
Wetland indicator category:** UPL, FACU[17]	**Benefits:** Rich in vitamins, minerals and antioxidants[19]. Evergreen during mild winters[12]

(Numbers identify sources listed on page 2-3)

Features: Thyme is rich in vitamins, minerals, and antioxidants. It also contains Thymol, an essential oil with antiseptic and antifungal properties[19]. Highly aromatic leaves, reach peak just before plants flower, and are frequently used fresh or dried as a seasoning. Good for soups, stews, sauces, meat and fish dishes. Whorls of tiny, tubular, lilac flowers appear on the stem ends in late spring to early summer. Flowers are attractive to bees. Plants are evergreen in mild winters[12].

Siting: Thyme is an upright, woody-based perennial which is primarily grown as a culinary herb. Best used in herb gardens. Makes a good companion plant for eggplant or tomatoes in vegetable gardens[12].

Care*:* Thyme can grow in most soils, but performs best in well-drained soil with moderate nutrients. Soil which is too rich will cause the plant to get leggy and lose its compact shape. Thyme will also grow in very shallow soil where few other plants will grow[19].

Pests: Soil must be well drained or root rot will be a problem[19].

This plant does not appear on the following invasive plant lists on (3/18/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/f970/thymus-vulgaris.aspx

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes

Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA*. Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/2089-thyme-thyme-common/guide/overview

Common name: Italian parsley

Latin name: *Petroselinum crispum*[12]	**Texture**: Medium[19]
Common name: Italian parsley[12]	**Growth rate**: Medium[12]
Flowers: Showy[12]	**Light:** Full sun to part shade[12]
Fruit: Small, oval-shaped, color varies from grayish to grayish brown[20].	**Moisture:** Medium[12]
Height & Width: 12"x12"[12]	**Soil*:** Moist, well-drained soils[12], pH range of 6.0-7.0[20]
Type: Biennial grown as annual[12,20]	**Zones**: 2-11[12]
Habit: Clumping[12]	**Origin:** Mediterranean[12]
Wetland indicator category:** Not available[17]	**Benefits:** Larval food for black swallowtail butterfly[12]

(Numbers identify sources listed on page 2-3)

Features: The flat serrated leaves have a much stronger and sweeter flavor than the other varieties, making it more desirable for cooking. Native to the Mediterranean area, parsley has a biennial life cycle, (flowering during the second season of growth), but is usually grown as an annual in our region, because the plants often die during cold winters. It has a fresh and clean, but slightly peppery flavor[20]. Attracts beneficial insects[19]. Parsley is a larval food plant for the black swallowtail butterfly[12].

Siting: Parsley does best in a sunny area which receives direct light for 6-8 hours a day, although it can tolerate some light shade. Plants will be more productive if grown in well drained soil that is fairly rich in organic matter, with a pH range of 6.0-7.0[20].

Care*:* Seeds can be started indoors in the late winter approximately 6-8 prior to the last frost. Seeds can also be sown directly in the ground after danger of spring frosts has passed. Cover seeds with 1/8 inch of soil, and keep them moist. Slow to germinate. Emerging seedlings will appear almost grass-like, with two narrow seed leaves opposite each other. Thin or transplant seedlings when they are 2-3 inches high. Final spacing should be 10-12 inches apart[20].

Pests: No serious insect or disease problems. Septoria leaf spot: rid field of excess plant material to limit inoculum. Use seed at least two years old, since the viability of seedborne Septoria is very low after this much time[21]. Carrot weevil: locate fields away from areas surrounded by woodlots, forest, or successional areas to reduce the number of overwintering locations for adult weevils. Parsley fields are on a three or five year rotation, with a conscious effort to locate newly planted fields away from previous parsley or carrot fields[21]. Flea beetles, leafhoppers: minor to none on parsley, except parsley

can act as reservoir of leafhoppers and aster yellows for lettuce; parsley is non symptomatic [21].This variety is relatively pest resistant if cultural preferences are met.

This plant does not appear on the following invasive plant lists on (3/3/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/e477/petroselinum-crispum.aspx

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/ Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA*. Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/576-parsley-gigante-italian/guide/overview

(20) University of Minnesota Extension. (2013) Retrieved from http://www.extension.umn.edu/distribution/horticulture/M1221.html

(21) Ohio State University Extension. (2008) Parsley Pest Management Strategic Plan. Retrieved from http://www.ipmcenters.org/pmsp/pdf/OHparsleyPMSP.pdf

Common name: Sweet marjoram

Latin name: *Origanum majorana* [12]	**Texture**: Medium[19]
Common name: Sweet marjoram[12]	**Growth rate**: Medium[19]
Flowers: Not showy, pink[12]	**Light:** Full sun[12]
Fruits: Small, brown nutlets[19]	**Moisture:** Medium[12]
Height & Width: 1 to 2 feet high, and 1 to 2 feet wide[12]	**Soil*:** Neutral to alkaline soils[12]
Type: Herbaceous perennial[12]	**Zones**: 9-10[12]
Habit: Upright mound[12]	**Origin:** Mediterranean and Turkey[12]
Wetland indicator category:** Not available[17]	**Benefits:** Thrives in gritty, sandy loams[12]

(Numbers identify sources listed on page 2-3)

Features: Sweet marjoram has branching, reddish, square stems that are densely clad with ovate, highly aromatic, pubescent, gray-green leaves up to 1.25" long. Small two-lipped, tubular, white or pale pink flowers with gray-green bracts bloom in spike-like clusters from mid to late summer. It has a mild, delicate flavor for seasoning soups, sauces, salads, stuffings, stews, roasts, vegetables and meats[12].

Siting: Marjoram performs best in average, dry to medium, well-drained soils in full sun. It prefers neutral to alkaline soils, and thrives in gritty, sandy loams. Superior soil drainage is the key to growing this plant well[12].

Care*:* Start seed indoors about 6 to 8 weeks prior to last spring frost or sow seed outdoors about two weeks prior to last spring frost. New plants may also be purchased from local nurseries. Cut back stems before flowers appear to encourage bushy growth. Leaf flavor is usually best before flowers bloom[12].

Pests: No serious insect or disease problems. Root rot may occur in wet, poorly drained soils.[12] The species is relatively pest resistant if cultural preferences are met.

This plant does not appear on the following invasive plant lists on (3/3/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/d828/origanum-majorana.aspx

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes

Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/544-marjoram-marjoram/guide/overview

(20) University of Minnesota Extension. (2013) Retrieved from http://www.extension.umn.edu/distribution/horticulture/M1221.html

Common name: Pepper 'Orange Blaze'

Latin name: *Capsicum annuum* 'Orange Blaze'	**Texture**: Medium[19]
Common name: Pepper 'Orange Blaze'	**Growth rate**: Medium[19]
Flowers: Not showy[4]	**Light:** Full sun[4,19]
Fruit: Two to three lobed fruits are 4" long and 1.5" wide[19]	**Moisture:** Medium[4,19]
Height & Width: 22-30" x 11-12"[19]	**Soil*:** Well-drained, organic soil; optimum pH 5.8 – 6.5[4]
Type: Annual[19]	**Zones**: 4-12[19]
Habit: Upright[19]	**Origin:** Native to Latin America[20]
Wetland indicator category:** Not available[17]	**Benefits:** Bred for high resistance to Bacterial Leaf Spot and Tobacco Mosaic Virus[19]

(Numbers identify sources listed on page 2-3)

Features: The 'Orange Blaze' Pepper is bred for early maturity, disease resistance, sweet taste and bright orange color[19]. This bell pepper can be used in a variety of dishes or eaten raw[19].

Siting: 'Orange Blaze' Pepper grows best in well-drained, loamy soil with at least 6 hours of sun[4,19]. Do not plant in areas that have had eggplant, tobacco, pepper or Irish potato planted in the previous year[4].

Care*:* Sow seeds indoors until threat of frost has passed and then transplant outdoors[4]. Keep soil moist until plant is established, then apply enough water to thoroughly moisten the root zone when the soil is dry or during drought. Modify water recommendations to reflect site drainage and rainfall. Apply 3" of mulch over the planted area. Do not allow mulch to touch the plant stems[18].

Pests: This variety is relatively pest resistant if cultural preferences are met.

This plant does not appear on the following invasive plant lists on (2/18/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.harrisseeds.com/storefront/images/PRODUCT/medium/11559.jpg

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes

Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY:

Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/3168-peppers-orange-blaze-pepper/guide/overview

Common name: Coriander or Cilantro 'Slow Bolt'

Latin name: *Coriandrum sativum* 'Slow Bolt'	**Texture**: Fine[19]
Common name: Coriander or Cilantro 'Slow Bolt'	**Growth rate**: Fast[19]
Flowers: Inconspicuous[18]	**Light:** Full sun to part shade[4,10]
Fruit: Inconspicuous[18]	**Moisture:** Medium[10]
Height & Width: 18-24" x 12"[19]	**Soil*:** Average, well-drained soil[4,10]; pH 6-7[4]
Type: Annual[4,10]	**Zones**: 2-11[10]
Habit: Upright[19]	**Origin:** Throughout North America[16]
Wetland indicator category:** Not available[17]	**Benefits:** Relatively pest resistant[12]

(Numbers identify sources listed on page 2-3)

Features: This annual herb is grown for both its leaves, known as cilantro, and its seeds, known as coriander[4]. The young leaves are used primarily in Latin and Asian dishes while the mature seeds are frequently used in Indian cooking[19].

Siting: Cilantro needs at least 6 hours of sun and performs best in well-drained, organic soils with a pH between 6 and 7[4].

Care*:* As with most annual herbs, Cilantro is grown primarily by seed during early spring[4]. Plant the seeds at a depth of ¼". Sow seeds 1" apart and then thin plants to 12" once germinated[19]. Germination usually takes 5 to 10 days[19]. Keep soil moist until plant is established, then apply enough water to thoroughly moisten the root zone when the soil is dry or during drought. Modify water recommendations to reflect site drainage and rainfall. Apply a thin layer of mulch over the planted area. Do not allow mulch to touch the plant stems[18]. Harvest leaves in summer and seeds during late summer[20].

Pests: Plants are relatively pest resistant if cultural preferences are met[12].

This plant does not appear on the following invasive plant lists on (2/18/2013):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source:
http://imavex.vo.llnwd.net/o18/clients/urbanfarm/images/Herbs/Coriander_Slow_Bolt.jpg

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Urban Farmer, Westfield, IN (2013). Retrieved from http://www.ufseeds.com/Coriander-Slow-Bolt.item

(20) American Horticultural Society. (2009). *New Encyclopedia of Gardening Techniques*. London, UK: Mitchell Beazley.

Common name: Romaine lettuce

Latin name: *Lactuca Sativa*[12]	**Texture**: Smooth[19]
Common name: Lettuce[12]	**Growth rate**: Fast[19]
Flowers: Not showy[12]	**Light:** Full sun to part shade[12]
Seeds: Very small[21]	**Moisture:** Medium[12]
Height & Width: 6"-12"x6"-12"[12]	**Soil*:** Moist, rich, well-drained soils[12], pH range of 6.0 to 6.5[21]
Type: Annual[12]	**Zones**: 2-11[12]
Habit: Upright[19]	**Origin:** Mediterranean[12]
Wetland indicator category:** Not available[17]	**Benefit:** Easy to grow, cool-season crop[19]

(Numbers identify sources listed on page 2-3)

Features: Romaine is just one of many types of lettuce that can be grown with little maintenance, and provide healthy leafy greens for salads, and sandwiches. Romaine is tolerant of cooler temperatures, and forms in a long cylindrical shape that leaves nothing to waste[19].

Siting: Lettuce is a cool-season vegetable and for best quality it should be grown under cool, moist conditions. Lettuce seedlings will tolerate a light frost. Ideal growing temperatures are between 45 F and 65 F[21]. Romaine lettuce can be grown in any size bed, including small beds, and container gardens[19].

Care*:* Romaine can be grown from either seeds or transplants. Since lettuce seeds are so small, it is best to start with a well prepared bed. Seeds can be started indoors six weeks before the preferred planting date, or transplants may be purchased locally. Romaine can be harvested by removing the outer leaves, digging up the whole plant or cutting the plant about an inch above the soil surface[21].

Pests: This variety is relatively pest resistant if cultural preferences are met. Bolting can become a problem in prolonged heat, particularly if plants dry out. This can be prevented by planting lettuce in the shade of other plants, and picking frequently. Bolting can also be a sign of full growth. If left to bolt lettuce can be very attractive, and will provide seed for future harvest[19].

Flea beetles may also be a problem, but weeding will deprive flea beetle larvae of food sources, and may help to lessen the flea beetle population[20].

This plant does not appear on the following invasive plant lists on (4/3/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://ancientomnivore.com/2012/08/09/garden-goodness/attachment/3269/

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center.

(2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/

plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes

Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Smart Gardener. (2013). Retrieved from http://www.smartgardener.com/plants/1342-lettuce-romain-lettuce/guide/overview

(20) University of Minnesota Extension. (2013) Retrieved from http://www.extension.umn.edu/distribution/horticulture/m1250.html

(21) Ohio State University Extension. (2008) Retrieved from http://ohioline.osu.edu/hyg-fact/1000/1610.html

Common name: Swiss Chard 'Pot of Gold'

Latin name: *Beta vulgaris* 'Pot of Gold'	**Texture**: Medium to coarse[19]
Common name: Swiss Chard 'Pot of Gold'	**Growth rate**: Medium[19]
Flowers: Small green or red flowers lacking petals develop on a long stalk which grows during the second season[19]	**Light:** Full sun, but can tolerate partial afternoon shade[19,20]
Fruit: Small clusters of nuts develop from aggregate of two or more flowers[19]	**Moisture:** Medium and consistent[19,20]
Height & Width: 24-36" x 18-24"[20]	**Soil*:** Well-drained, organic soil[19]
Type: Biennial[19]	**Zones**: 8-11[19]
Habit: Upright[19]	**Origin: USA** (AL, CA, CT, MA, ME, MI, MO, MT, NC, NH, NY, OR, PA, SC, TX, UT, VA, WV), **USA+** (PR)[16]
Wetland indicator category:** UPL[17]	**Benefits:** Attractive foliage allows for use in flower beds[19]

(Numbers identify sources listed on page 2-3)

Features: The 'Pot of Gold' Swiss Chard can be grown in containers, in a vegetable garden or used as an ornamental in the flower bed[19]. This particular variety features bright yellow stems with dark green foliage[19,21]. A close relative of the beet, this particular chard is grown for its foliage and can be prepared in a variety of ways[19,20,21].

Siting: 'Pot of Gold' Swiss Chard grows best in well-drained, loamy soil with at least 6 hours of sun, though it can tolerate some afternoon shade[19]. Consistent moisture is required for this plant[19,21]. Chard is tolerant of mild frosts and is more tolerant of hot weather than most other greens[19].

Care*:* Sow seeds indoors until threat of frost has passed and then transplant outdoors[4]. Keep soil moist until plant is established, then apply enough water to thoroughly moisten the root zone when the soil is dry or during drought. Modify water recommendations to reflect site drainage and rainfall. Apply 3" of mulch over the planted area. Do not allow mulch to touch the plant stems[18]. Swiss Chard should not be allowed to dry out completely as excessive fluctuations in moisture causes the beet root to crack[19].

Pests: Watch for slugs and snails[20]. Otherwise, plants are relatively pest resistant if cultural preferences are met.

This plant does not appear on the following invasive plant lists on (4/1/13):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://d3t0t2nqwmr1c9.cloudfront.net/photos/57451/chard-gold2.medium.jpg

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/ flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Groundcovers & vines fact sheets.* Retrieved from http://www.clemson.edu/ extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center. (2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/ plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes

Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/ Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Floridata. (2003). Retrieved from http://www.floridata.com/ref/b/beta_vul.cfm

(20) Ohio State Univeristy. (2012). Retrieved from http://bygl.osu.edu/content/vegetable-swiss-chard-beta-vulgaris-subsp-cicla

(21) Renees's Garden. (2013). Retrieved from http://www.reneesgarden.com/seeds/packpg/veg/chard-gold.htm

Common name: Borage

Latin name: *Borago officinalis*	**Texture**: Coarse[19]
Common name: Borage	**Growth rate**: Moderate[19]
Flowers: Small, star-shaped blue flowers[20]	**Light:** Full sun to light shade[12,19]
Fruit: Four small nutlets replace each flower[20]	**Moisture:** Dry to medium[12]
Height & Width: 1-3' x 1'[13]	**Soil*:** Average, well-drained soil[12,19]
Type: Annual[12,13]	**Zones**: 2-11[12]
Habit: Upright[19]	**Origin:** Native to Mediterranean, but naturalized throughout the United States [16]
Wetland indicator category:** Not available[17]	**Benefits:** Attractive to bees and other beneficial wildlife[21]

(Numbers identify sources listed on page 2-3)

Features: This annual herb is grown for both its leaves and its attractive flowers, both of which can be used in various recipes[13,19]. Although typically grown as an annual herb, Borago spreads by reseeding itself and may need to be kept in check each spring season[19]. The flowers attract beneficial pollinators such as bees[13].

Siting: Borago requires at least 6 hours of sun and performs best in well-drained, organic soils[12].

Care*:* Sow indoors or directly in the garden during early spring[20]. Keep soil moist until plant is established, then apply enough water to thoroughly moisten the root zone when the soil is dry or during drought. Modify water recommendations to reflect site drainage and rainfall. Apply a thin layer of mulch over the planted area. Do not allow mulch to touch the plant stems[18]. Harvest young leaves and flowers when present[19].

Pests: Plants are relatively pest resistant if cultural preferences are met.

This plant does not appear on the following invasive plant lists on (4/1/2013):

X USDA SC Invasive Plant Species Web site at http://www.invasivespeciesinfo.gov/plants/main.shtml

X SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Image: 

Image source: http://www.burpee.com/images/product/prod000462/prod000462_lg.jpg

Sources:

(1) Armitage, A. (2001). *Armitage's manual of annuals, biennials, and half-hardy perennials.* Portland, OR: Timber Press.

(2) Armitage, A. (2006). *Armitage's native plants for North American gardens*. Portland, Oregon: Timber Press.

(3) Armitage, A. (2008). *Herbaceous perennial plants: A treatise on their identification, culture, and garden attributes.* Athens, GA: University of Georgia.

(4) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Flowers fact sheets.* Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/

flowers/

(5) Clemson Cooperative Extension Home and Garden Information Center.(2011).

Groundcovers & vines fact sheets. Retrieved from http://www.clemson.edu/

extension/hgic/plants/landscape/groundcovers/

(6) Clemson Cooperative Extension Home and Garden Information Center.

(2011). *Trees.* Retrieved from http://www.clemson.edu/extension/hgic/

plants/landscape/trees/

(7) Clemson Cooperative Extension Home and Garden Information Center.(2011). *Shrubs.*

Retrieved from http://www.clemson.edu/extension/hgic/plants/landscape/shrubs/

(8) Dirr, M. A. (2009). *Manual of woody landscape plants*. Champaign, IL: Stipes Publishing.

(9) Gilman, E. F. (1997). *Trees for urban and suburban landscapes*. Albany, NY: Delmar Publishers.

(10) Lady Bird Johnson Wildflower Center University of Texas at Austin. (2012). *Native plant information network*. Retrieved from http://www.wildflower.org/explore/

(11) McMillan, P., Plant taxonomist Clemson University, personal communication.

(12) Missouri Botanical Garden Kemper Center for Home Gardening. *Plant finder*. Retrieved from http://www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

(13) North Carolina State University (2005). *Plant fact sheets*. Retrieved from http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/index.html

(14) Strother, E. V., Ham, D. L., Gilland, L. (2003) *Urban tree species guide: Choosing the right tree for the right place.* Columbia, SC: South Carolina Forestry Commission.

(15) University of Florida, IFAS Extension. (2011). *Southern trees fact sheet.* Retrieved from http://edis.ifas.ufl.edu/department_envhort-trees

(16) USDA. *Plant profile.* (n/d).Retrieved from http://plants.usda.gov/java/

(17) USDA. *Plant wetland indicator status.* (n/d). Retrieved from http://plants.usda.gov/wetland.html

(18) Vincent, E., Environmental horticulturist Clemson University, personal communication.

(19) Illinois Wildflowers. (2012). Retrieved from http://www.illinoiswildflowers.info/weeds/plants/borage.htm

(20) W. Atlee Burpee & Co. (2013). Retrieved from http://www.burpee.com/herbs/borage/borage-prod000462.html;jsessionid=FDA65F1A21D3116CB90417B40B053A19?catId=2183&trail=&_requestid=634109

(21) Plants For A Future. (2012). Retrieved from
http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis

***Soil ph is determined using a professional soil test. Contact your Clemson University County Extension service for assistance www.clemson.edu/extension/. Click on "local offices".**

****2012 Plant Wetland Indicator categories (quantitative derived) http://plants.usda.gov/wetinfo.html**

Indicator Code	Indicator Status	Comment
OBL	Obligate Wetland	Almost always is a hydrophyte, rarely in uplands
FACW	Facultative Wetland	Usually is a hydrophyte but occasionally found in uplands
FAC	Facultative	Commonly occurs as either a hydrophyte or non-hydrophyte
FACU	Facultative Upland	Occasionally is a hydrophyte but usually occurs in uplands
UPL	Obligate Upland	Rarely is a hydrophyte, almost always in uplands

Appendix D: Starting a vegetable garden

www.growit.umd.edu

How to Start a Vegetable Garden: 6 Basic Steps

STEP 1—Plan your garden.

• Will you grow vegetables and herbs in containers or in garden soil?

• Start small with an in-ground garden and expand when you are ready. A good starter size is50-75 sq. ft.

• Will you dig or till your entire plot, or perhaps use raised beds?

• Grow vegetables that you like to eat and are expensive to buy. Some of the easiest vegetables are bush bean, tomato, cucumber, pepper, lettuce, summer squash, and leafy greens (Swiss chard, kale, mustard, etc.).

• Place taller crops on the north and west sides so they will not shade shorter plants.

• Group plants by what season they grow in and how long they take to come to maturity. (This information is available on the Grow It Eat It website.)

• Early, short-season crops, like lettuce, can give way to late season crops after harvest.

STEP 2—Select your site.

• Your garden should be on level ground in a spot that gets at least 6 hours of full sun a day(preferably more).

• Avoid trees, shrubs, and buildings where possible.

• Make sure you have access to every part of your garden—include paths.

• Easy access to water is essential.

• Know your local animal population and fence as needed.

STEP 3—Prepare your soil.

• Vegetable garden soil should be deep and crumbly, should drain well, and should contain plenty oforganic matter.

• Have your soil tested to determine nutrient levels and pH, and to be sure it is safe to plant in (low lead level).

• Turn under or remove the grass sod but do not dispose of it as sod contains valuable topsoil andorganic matter. You can also kill the grass by covering it with sections of newspaper and then covering that with a 2 to 4 inch layer of compost.

• A small plot (less than 100 sq. ft.) can be prepared using hand tools.

• Add organic matter, such as compost, manure, chopped leaves, etc. Organic matter should make up one quarter of the top 8 inches of your soil by volume.

• Garden beds may either be surrounded by an enclosure or built up with sloped sides and no enclosure.

STEP 4—Plant your crops.

• Check the Grow It Eat It website to determine whether a particular vegetable is best direct-seeded in the ground or whether its seeds have to be planted indoors and grown to transplant size. You can buy seeds and transplants from local stores.

• If you buy seedlings to transplant, make sure they look healthy and are not so overgrown that roots encircle the bottom of the pot.

• Transplants raised inside your home or in a greenhouse should be exposed gradually to outdoor temperatures and conditions; this is called "hardening off."

• Transplant on a cloudy, calm afternoon if possible, and water well; handle plants carefully and make sure there is adequate room for the roots in the planting hole.

STEP 5—Take care of your garden.

• Water deeply around the base of your vegetable plants, as necessary, to keep the roots systems moist. Frequent, shallow watering is good for newly planted seeds—not mature plants.

• Water in the morning when possible. Use a soaker hose or drip irrigation system to reduce water use.

• Fertilize as necessary based on your soil test recommendations, fertilizer label instructions, and the needs of your different crops.

• Control weeds by laying down organic mulches, slicing or chopping weeds with a hoe, and hand-pulling. Start early, as soon as weeds appear.

• Support tomato, pepper, and cucumber plants with stakes or trellises to save space.

• Monitor plants regularly for problems; check out Maryland Cooperative Extension's resources for solutions. Learn to take an integrated pest management (IPM) approach to any plant or pest problem. Vegetables and herbs can be grown successfully in Maryland gardens without chemical pesticides.

STEP 6—Harvest and enjoy!

Author: Erica Smith, Maryland Master Gardener, Montgomery Co.
March, 2009

Appendix E: Photo Journal