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The Edible Home Landscape: Nutritious, Sustainable, Aesthetic, Feasible

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An Introduction to ATINER's Conference Paper Series

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The Edible Home Landscape: Nutritious, Sustainable, Aesthetic, Feasible

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Abstract

In many regions and climates, soil and weather conditions are suboptimal for vegetable gardening and few households attempt or sustain their own garden. Integrating edible plants into the home landscape using raised beds is cost effective, requires minimal maintenance, and is sustainable. The objective of this research garden was to evaluate if raised bed gardening of vegetables and fruit with the inclusion of fruiting trees, bushes, and vines can yield sufficient produce servings for each member of a family of four in the home landscape. The experimental home food production garden, built in the hot-humid climate zone in the southeastern United States, consisted of four .9 m by 12 m raised beds filled with a commercially available friable soil composed of sand and organic matter. In the model, additional food servings would be provided by 10 fruit trees, 8 blueberry bushes, and a grape (muscadine) arbor. The four raised beds produced 3600 servings of vegetables for the year, and the fruiting trees, bushes, and vines would produce 3200 - 5000 servings, totaling more than 7200 servings annually; adequate produce to provide the 5 recommended vegetable and fruit servings per day for a family of 4.

Key words:
Corresponding Author:

Introduction

Fruit and vegetables are two of the most nutrient dense food groups on earth and have been essential to the growth of many societies throughout history. Traditionally, cultures were limited in exposure to endogenous plants; different climates and regions experienced a restricted variety of produce, but consumed copious amounts of what they could grow or harvest because they inherently knew the benefits, or more importantly, the consequences of not consuming enough. As the food environment has transformed significantly over the past two centuries, the diets and subsequently the health of people living in developed countries have suffered as well. In the United States, the once ubiquitous home garden began to disappear after the Industrial Revolution of the nineteenth century but found rebirth in the Victory Garden movement that began during World War I.[1] Home gardening was associated with patriotism, but more importantly food security, especially into the 1930s. After World War II, home gardens began to disappear from the landscape as urban sprawl led to poor land use and a faster paced lifestyle. Though Home Economics was part of most secondary education programs throughout the 1960s and 1970s, many American adults became disconnected from the production, processing and preparation of their food.[2] The quality of the American diet began to decrease as fewer fruits and vegetables were consumed.

In 1986, The National Cancer Institute in the United States established dietary goals for the prevention of cancer and diet-related diseases.[3] One of the nutritional guidance campaigns that was initiated and sustained from this effort was the "Five a day for Better Health" program that urged individuals to consume at least five servings of fruits and vegetables daily. Though this message has been pervasive and modified to other campaigns such as "More Matters," the majority of Americans have continuously fallen short of fruit and vegetable consumption goals. Americans have spent increasingly less time in food preparation and consume more meals prepared outside the home, which are often less nutritious than home prepared meals.[4]

Projections of past trends into the year 2020 estimate that consumers will spend even more of their food dollars on prepared and ready-to-eat foods, but home consumption of fruits and vegetables is also expected to increase.[5] Studies continue to indicate that socioeconomic status is highly correlated to

[1]Pack, C. L. (1919). The War Garden Victorious: Its Wartime Need and Its Economic Value in Peace. In): Philadelphia: JB Lippincott Company.
[2]Lichtenstein, A. H., & Ludwig, D. S. (2010). Bring back home economics education. JAMA, 303(18), 1857-1858.
[3]National Cancer Institute: Cancer Control Objectives for the Nation: 1985-2000. Washington, DC, U.S. Government Printing Office, 1986.
[4]Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A., & Ludwig, D. S. (2004). Effects of Fast-Food Consumption on Energy Intake and Diet Quality Among Children in a National Household Survey. Pediatrics, 113(1), 112-118.
[5]Blisard, N., Lin, B.-H., Cromartie, J., & Ballenger, N. (2002). America's changing appetite: Food consumption and spending to 2020. Food Review, 25(1), 2-9.

fruit and vegetable consumption.[1] The perceived economic barrier to healthy eating[2] can be reduced or eliminated when fruits and vegetables are produced rather than purchased. This concept is important for all socioeconomic classes, because growing, harvesting and/or cooking produce is a proven means to increase fruit and vegetable consumption, especially in children.[3,4]

Methods

This home garden model is unique in its ability to produce substantial vegetable and fruit yields with minimal inputs. In the Southeastern United States, many homes and communities have ample green space that can be used for food gardening. Originally designed for a 0.25-0.5 acre lot, adequate sunlight is the primary potential limiting factor in maintaining a productive garden. Figure 1 represents an example master plan for the Home Food Production Garden. Property borders are used to incorporate fruit trees, bushes, trellised plants, and raised beds built into the landscape. Spaces with large trees and excess shade may limit the growth potential of fruiting trees, bushes, vines and the vegetables grown in raised beds. The summer garden thrives when plants receive a minimum of six-eight sunlight hours daily. Cold weather plants are dependent on soil health as well as sunlight. Landscape architects can assist in integrating the Food Production Garden into the home landscape by maximizing utilization of space, precise location of shady and sunny areas, and water conserving irrigation for the various trees, bushes, vines, and the raised beds.

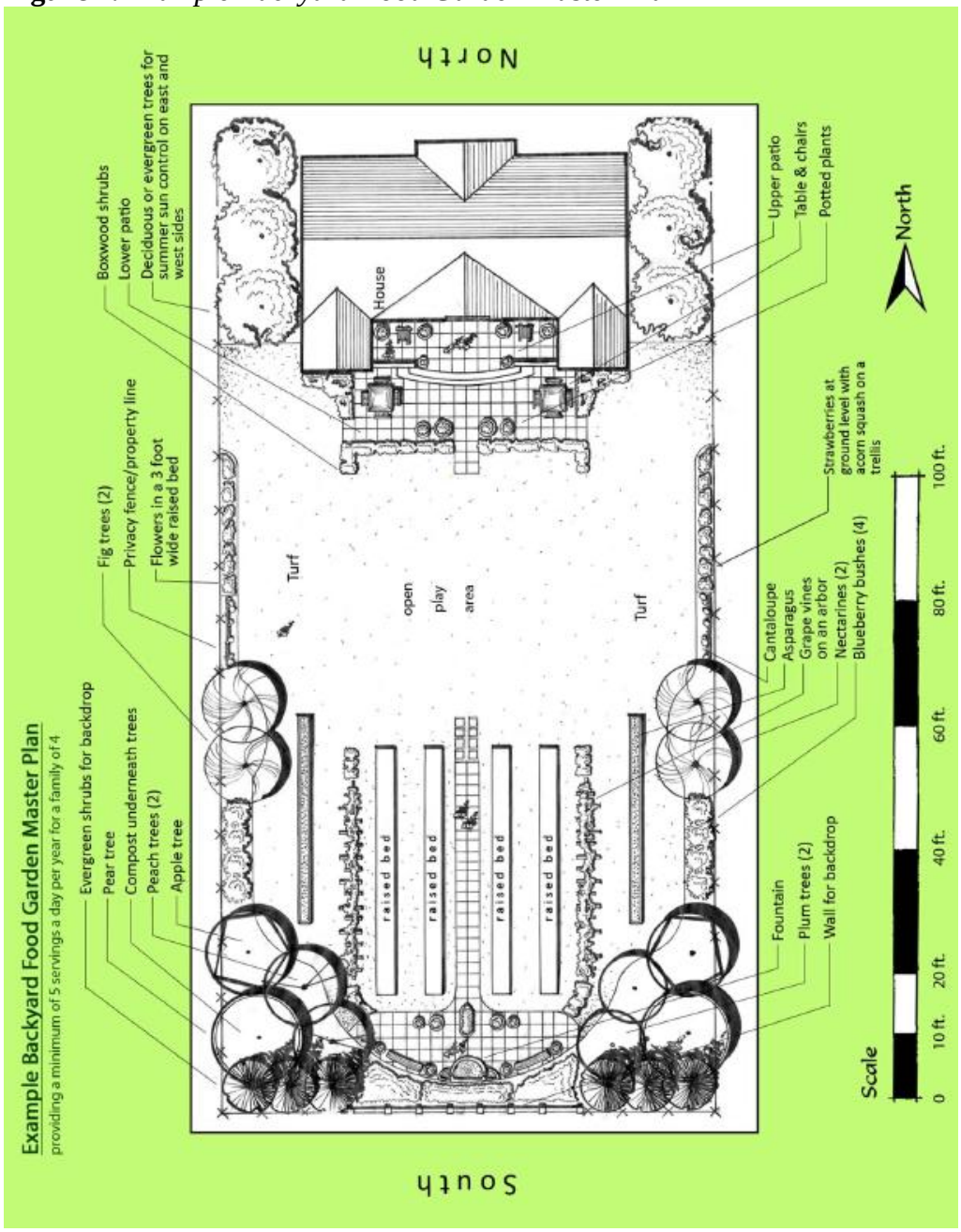
[1]Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. JAMA: The Journal of the American Medical Association, 303(3), 235-241.

[2]Yeh, M.-C., Ickes, S. B., Lowenstein, L. M., Shuval, K., Ammerman, A. S., Farris, R., & Katz, D. L. (2008). Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA. Health Promotion International, 23(1), 42-51.

[3]Parmer, Sondra M., Salisbury-Glennon, Jill, Shannon, David, & Struempler, Barbara. (2009). School Gardens: An Experiential Learning Approach for a Nutrition Education Program to Increase Fruit and Vegetable Knowledge, Preference, and Consumption among Second-grade Students. Journal of Nutrition Education and Behavior, 41(3), 212-217. doi: 10.1016/j.jneb.2008.06.002

[4]Twiss, Joan, Dickinson, Joy, Duma, Shirley, Kleinman, Tanya, Paulsen, Heather, & Rilveria, Liz. (2003). Community Gardens: Lessons Learned From California Healthy Cities and Communities. American Journal of Public Health, 93(9), 1435-1438. doi: 10.2105/ajph.93.9.1435

Figure 1. *Example Backyard Food Garden Master Plan*



Design

Four raised beds are built using lumber, rock, brick or any other material suitable for containing a minimum of 0.15 meters additional soil above ground level. Dimensions for each of the beds are 0.9 meters by 12.2 meters.[1] The narrow width allows for easy management and harvesting, i.e. an average person can reach the entirety of the planted area from either side of the bed,

[1]Melby, Pete. (2011) Home Food Production Garden and Garden Planner. www.Energy usereduction.com

while avoiding stepping into the bed and compressing the soil. This latter feature of the design is important because roots grow in soil voids which are the conduits for air, water and nutrient transfer to the root zone. The 0.9 m width allows for easy access for removal of stray weeds and grasses. Other benefits of the raised bed include improved water holding capacity and soil temperature moderation.

Maintaining soil quality is imperative for garden productivity and can be easily managed through composting. By repurposing yard, garden, and table waste (and other forms of organic matter including junk mail) through microbial degradation, nutrient dense compost can be added back to the garden beds each season thereby reducing the need for added fertilizers and eventually eliminating the need for chemical fertilizers. Composting bins or dedicated areas for composting can be integrated into the landscape, thereby providing a ready source of soil amendment that regenerates soil and eliminates the need for mechanical tillers and shovels in the raised bed gardens. Regenerating soil with compost allows the gardener to complete gardening tasks by hand, using a hoe instead of a rotary tiller.

Planning

Deciding on the plants and quantities to grow in the garden can be determined by calculating the food servings to be produced using the Home Food Production Garden Food Servings Calculator[1]. The food servings produced is based on the average production rates for vegetables and fruit and the potential spacing of garden plants in a 3 foot wide raised bed.

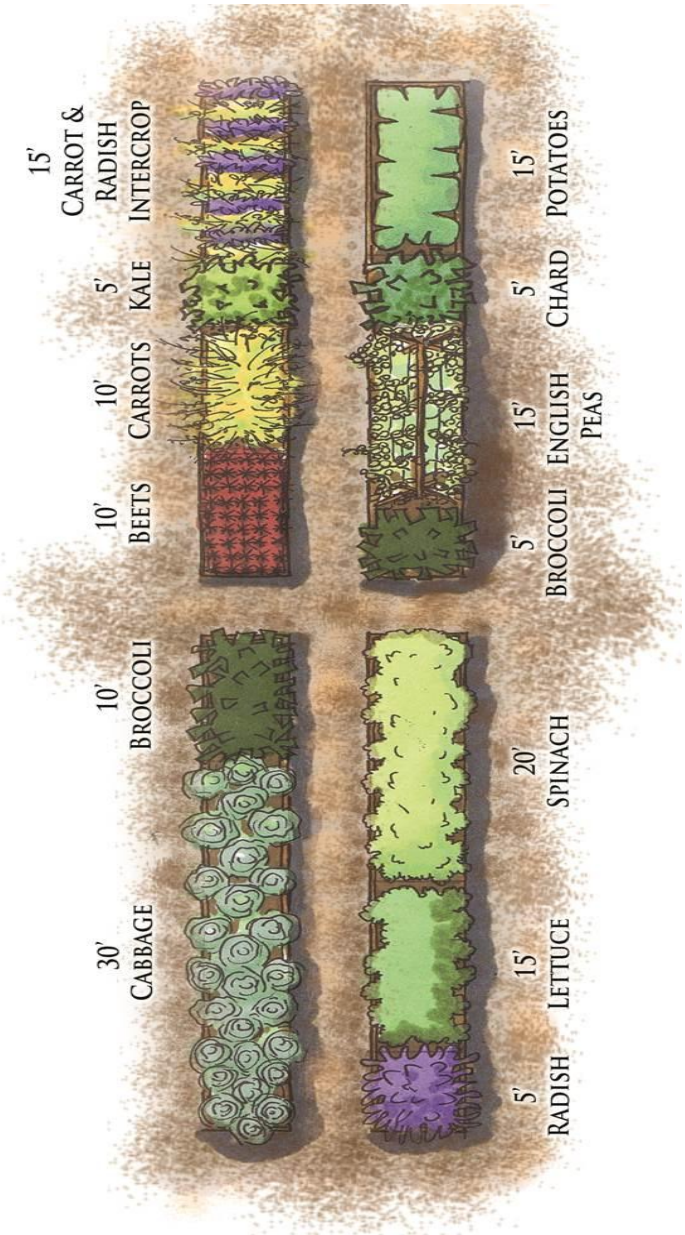
In the southeastern United States, vegetables can be divided into warm and cold weather plants. Warm weather plants are typically planted between March and July, while cold weather plants can be planted from August until February. For planning purposes, this garden model assumes two cold weather gardens (planted in August and February) and one warm weather garden (planted in April). Figure 2 represents the layout and vegetables planted in the first season (spring) of the experimental garden.

Depending on temperature highs and lows, many vegetables can continue to grow through multiple seasons. Spring planted Swiss chard, carrots, lettuces, radishes, onions, red potatoes, and cabbage can be productive into the warmer temperatures of early summer. However, care must be taken to harvest leafy greens before high temperatures wilt leaves or the plant bolts. Conversely, multiple warm weather plants may continue to produce into the late fall, so it may not be necessary to replace the entire garden simply because the seasons are changing. Generally, cold weather plants consist of root, cruciferous, and leafy green vegetables; warm weather plants are primarily fruiting vegetables that must be pollinated for productivity.

Considerations in choosing the type and quantity of vegetables to plant are numerous, however many home gardeners will simply choose the quantity of vegetables they like in a derivative of how the seeds or starter plants are sold. Because the ultimate goal of planting a garden is to consume the produce, it is natural to choose vegetables that are most familiar or already consumed. Even

a diversely planted garden this size can produce upwards of 300 servings in a given week during peak production; therefore it is important to consider the amounts of produce that can be 1) consumed immediately or in the near future, 2) preserved by means of freezing or canning, and/or 3) shared with others so that waste is minimal. A family of four could not feasibly consume the fruits of 40 row feet of tomatoes in late July, so these considerations are important. Similarly, the fruit produced from trees, bushes and vines will have concentrated times of harvest, so preservation is essential to enjoying these nutrient rich foods year round.

Figure 2. *Experimental Spring Garden Layout*



Aside from planting appropriate quantities of select vegetables, timing of planting can be staggered to maximize productivity while minimizing waste. For example, planting radishes with carrots (intercropping) is effective because the radishes will reach maturity in a matter of weeks. Once the radishes are harvested, the carrots have ample room and aerated soil to grow in the coming months. All one-time harvest root vegetables can be replaced as long as temperatures remain ideal for the particular vegetable.

Results

In order to effectively plan the vegetable garden, a calculator was developed[1] to project the number of servings produced based on the number of row feet planted per given vegetable. Estimates of row foot production are based on published state averages provided by the Mississippi State University Extension Service.[2] Production estimates not published were calculated using comparable crops and experimental data. Ready-to-eat (RTE) portion yields provide the actual number of USDA servings that are edible from harvest weight. Vegetable and fruit RTE servings produced were obtained from the Food Buying Guide for Child Nutrition Programs[3] and verified in the first year of harvest using experimental data.

Using a garden plan composed of four 0.9 meters by 12.2 meter raised beds that incorporates a large plant and nutrient diversity, estimates of annual production exceed 3,600 servings of vegetables in the raised bed garden. In the experimental garden's first year, actual yields exceeded 3,300 servings of vegetables, which would provide a family of 4 with approximately 2.4 vegetable servings per day. The summer garden was highly productive, however temperature and rainfall variability resulted in below average production for the fall and spring gardens.

The addition of fruiting trees, bushes and vines as indicated in Figure 1 would provide between 2000 to 5000 additional servings, which would naturally increase from the low to higher end of the range as the plants mature from year to year.

Conclusion

The Home Food Production Garden model is a sustainable means for producing five daily fruit and vegetable servings for a family of four. These

[1]Melby, Pete. (2011) Home Food Production Garden and Garden Planner. www.energyuse reduction.com

[2]Mississippi State University Extension Service. (2011). Garden Tabloid. http://msucares.com/ pubs/publications/p1091.pdf

[3]United States Department of Agriculture (2013) Food Buying Guide for Child Nutrition Programs. http://teamnutrition.usda.gov/resources/fbgvegfruits.pdf

designs, concepts and management practices are simple and require little input after initial construction.