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Saving Money While Participating in Urban Agriculture

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By Jill Wieneke

Abstract

With more and more people pouring into urban areas, many have become unattached to where their food comes from and are disengaged with local food systems. Urban agriculture (UA) can bring people closer to healthy foods and be a potential savings. This will bring more resilience to a community and amend food insecurities Through this case study at the Hawley Hamlet Neighborhood Garden, urban gardeners can understand the capabilities of UA and the effects of food affordability into urban settings. This case study is an example of vegetable outputs and cost savings that can be obtained at a community garden in Lincoln, NE. Vegetables were weighed from two garden plots that equaled 50 square foot each of garden space for a four-month period. When comparing the prices of vegetables with three local grocery stores, the savings in the two garden plots averaged $497. Results show that the square foot gardening method is similar to intensive urban gardening with producing 3.13 pounds per square foot and a savings of $1.59 per square foot. The potential food savings initiates the desire for keeping resources within the community and providing local economic wealth. The assessment made by the Mayor's Environmental Task Force suggests Lincoln needs 33 acres to be 1% self-reliant and currently the city has approximately 1.5 acres in community gardens. This demonstrates the need for more UA and self-reliance within the city of Lincoln. Promoting UA through government involvement and citizen action is necessary for the success of UA.

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Introduction

Urban agriculture (UA) brings rural agriculture into the urban community. It connects consumers and stakeholders with the local food production system, defined as the chain of activities connecting food production, processing, distribution, consumption, and waste management, as well as the regulatory institutions and activities (Pothukuchi and Kaufman, 2000). UA is not only a food source, also provides other benefits such as community building, promoting health, strengthening local economies and reducing human impact on the environment (Grewal and Grewal, 2011; Guitart et al, 2012).

With over half of the world's population in urban areas, people are less likely to produce or understand where their food comes from, and are more likely to consume food that has been transported long distances (Campbell, 2004; Clements, 2010). The continued reliance on the import of food and food products leaves a community vulnerable and contributes to the compounding problem of food insecurity and safety, environmental problems and climate change. Growing concerns about the quality of food, rising food prices and food insecurity have increased interest in growing food locally (Guitart et al, 2012). Food insecurity defined by the United States Department of Agriculture (USDA, 2017) is the inability to access enough nutritionally adequate food for an active and healthy lifestyle at all times.

Advances in industrial agriculture have progressed to heights that have changed the world. Globalization and the boom of the green revolution have brought technology and new ideas and have spread culture and social impacts through their influence. This brings an unhealthy dependence on foreign goods which communities could grow at home. The average distance for food to travel is typically 1,494 miles and UA has the potential to improve the environment by reducing food miles from farm to table (Pirog, 2003). A reduction in transportation would bring produce closer to the table meaning fresher, longer lasting produce. Increasing food quality and security in urban areas and reducing environmental footprints requires the incorporation of UA (Grewal and Grewal, 2011). Therefore, UA strengthens a city's resilience by shaping economics from within the community and enhances its ability to adapt to changes and climate uncertainties.

Urban Agriculture

Home gardens are not anything new and are the most enduring of all urban agricultural enterprises as families have supplemented food intake with UA from their home gardens around the world for millennia. Research on home gardens, particularly in the developed world, is sparse, mostly due to the informal nature of home gardens as well as their enclosed and private nature (Gray et al, 2010). The USDA defines UA as city and suburban agriculture which takes the form of backyard, roof-top and balcony gardening, community gardening in vacant lots and parks, roadside unban fringe agriculture and livestock grazing in open space (www.nal.usda.gov, 2017). The Food and Agriculture Organization of the United Nations (FAO) defines UA as the growing of plants and raising livestock within and around cities. UA offers produce (vegetables, fruits, mushrooms, etc.), animals (poultry, sheep, pigs, goats, cattle, etc.) - and non-food products (medicinal herbs, soaps, tree products) (www.fao.org, 2017). There are many forms of UA and wide ranges of ways a stakeholder can participate based on their availability to land and water.

In times of crisis, like war, recession and/or natural catastrophes, growing food in the urban environment has been essential for survival. It was a choice of going hungry or growing food. *Schrebergaerten* (garden plots) were started in Germany after the First World War. During the Second World War, Britain established the Dig for Victory campaign, and the United States planted Victory Gardens to help with potential food shortages (www.nationalww2museum.org, 2017). These are all examples of agriculture brought to the city in times of need. In our current economy, however, economic challenges, environmental stewardship and concerns about food quality are key drivers for UA. Accordingly, UA contributes to resilience and sustainability within the city in many ways-socially, economically, and environmentally (Deelstra and Girardet, 2000).

Policy Change for local economics

Food security advocates proposed the creation of a "Department of Food" (Pothukuchi and Kaufman, 2000). This department would focus on organizing community gardens, food sheds and food policy committees to implement a local food system within urban areas (Corrigan, 2011). However, if involvement in the local food system came from citizens, communities, and advocates, the results could result in a democratic food system. Food democracy is the right that every person has in participating in the decisions that determine our access to safe, nutritious food. (Potukuchi and Kaufman, 2000).

Knowing how to grow food in backyards, community gardens, small farms, and commercial farms within the city will be beneficial for the economy. This could evolve into a local food system along with building employment through UA. When policy makers understand the economic potential that UA can bring to the city, then local government will sponsor and support UA. Pothukuchi and Kaufman (2000) conducted surveys of 22 US city planners and gave evidence of their limited attention to the food system. They gave reasons as to why city planners should be involved in the local food system and devote more attention to the food system. This prompted the assembly of the American Planning Association (APA) to produce the *Policy Guide on Community and Regional Food Planning in 2007*, demonstrates that local food movements and efforts can foster local support and education. (APA, 2007; Grewal and Grewal, 2011). Support for local economies and local farmers encourages communities to reclaim control of their economic destinies with local investments, including supporting local food growers (Shuman, 1998).

Building Community

When UA turns into neighborhood gardens, community emerges and involves people connecting to each other through involvement of local food systems (Corrigan, 2011). Developing UA inside cities builds social networks- trust, civic engagement, and the sharing of goods, services, and information (Bellows et al, 2005). Additional research on community gardening can improve our understanding of the interaction of social and physical environments and community health, and effective strategies for empowerment, development, and health promotion (Armstrong, 2000). "Those who control our food control our lives, and when we take that control back into our own hands, we empower ourselves toward autonomy, self-reliance, and true freedom" (Flores, 2006).

Growing a Healthy Diet

The multiple potentials of UA in the form of home gardening are most important because of the direct access to nutritious foods and this will encourage healthy lifestyle and physical exercise activity (Marsh, 1998; Eliades, 2013; Guitart et al, 2012; Grewal and Grewal, 2011). The lack of access to fresh, healthy foods is related to poor diets, higher levels of obesity, and other diet-related issues (USDA, 2016). Growing your own food saves household expenditures on food; underprivileged individuals and families generally spend a substantial part of their income on food and have been found in food deserts which further increases the cost of food. The ability to purchase quality food is related to affordability, accessibility and the income of the consumer (Corrigan, 2011). Therefore, growing food, especially for vegetables, saves money and this is especially important for low income families. Through participating in UA, stakeholders understand where their food comes from and have access to fresh fruits and vegetables for healthier living.

Objective

The objective of this study, accordingly was to calculate the potential savings stakeholders could derive from planting 100 square foot of garden space in their backyard or community gardens. The level of savings constitutes potential for greater self-reliance in the food system and overall economic savings within the community. It is expected that stakeholders will want to be a part of their local food systems and bring economic growth to the city while saving money growing food for themselves. This could be inspiration for policymakers to expand UA to encourage self-reliance and environmental stewardship. When the city reaches

resilience in food security, the positive social, economic and environmental impacts will follow (Grewal and Grewal, 2011).

Methods

Estimation of current level of local self-reliance in food

The Nebraska Community Garden Task Force (2016) recognized 184 community gardens within the state of Nebraska and nearly fifteen are operating community gardens within the city of Lincoln, Nebraska. The community gardens within the city are for education, plot rentals for individual space, Community Shared Agriculture programs (CSA), neighborhood gardens, and commercial gardens. The city hosts farmer's markets almost every day of the week to sell locally grown produce to the city's consumers (Nebraska Community Garden Task Force Final Report to the Nebraska Legislature, 2016).

Open Harvest Co-op Grocery in Lincoln, NE is a neighborhood grocery store that provides local and organic products to their customers, and defines local food as "a farm to store distance of less than 200 miles and grown or produced within Nebraska" (www.openharvest.coop, 2017). Last year, Open Harvest purchased $557,910 from 87 local farmers and food producers. This amounted to over 30% of their sales coming from a local source.

The Hawley Hamlet Neighborhood garden is one of the fifteen gardens within the city of Lincoln and this garden is unique in its motivations. The gardens purpose is to provide garden plots for the surrounding neighbors who would like to participate in growing food for themselves and their families. This opportunity allows participants to learn where their food comes from, and how to grow their own food. The long-term goal is seeking the potential of growing food for self-reliance and the savings that can be obtained.

Background and Site Selection

From May 2016 to September 2016, I interned at The Hawley Hamlet Neighborhood Garden. I had first-hand experience of gardening and built relationships with fellow gardeners who were interested in positively impacting themselves, their neighborhood and the local food system. The Hawley Hamlet consists of individual garden plots, three bee hives, three chicken coops, three hoop (high tunnels) houses, and large garden beds planted for the participants in the community garden. I worked in all areas of the garden to learn all levels of food production.

Square Foot Gardening Approach

The square foot gardening method consists of planting the garden in squares of 12 by 12 inches, an area of 1 square foot. The number of plants within the square foot depends on the kind of fruit or vegetable that is grown and the variety. The spacing depends on how big the plant gets and how far apart they should be planted to reach their potential growth. For example, pepper plants need 12 inches of space between plants so one plant gets planted directly in the middle of the square foot. For lettuce, the recommendation is four plants per square foot and for radish and onion, only three inches apart. With planting these three inches apart, sixteen plants will fit into one square foot (Bartholomew, 2005). While taking advantage of all the space within the garden plot, this method of planting maximizes potential yield.

The square foot gardening method was used to plant two garden beds, planted in vegetable crops only, and each bed was approximately 50 square feet. The garden plots were 4-foot-wide so allowing planting all the way around the bed without stepping in to the bed and disturbing the soil by compacting it. A three-foot path was built between the garden beds and all the way around and the paths were covered in mulch. Soil compaction eliminates the air space between soil particles and makes it difficult for water and air to penetrate to the plants' roots (Bartholomew, 2005). Therefore, planting, weeding and any activity within the plot had to performed without stepping into the garden area. Participation increases when feelings of control over the environment in a positive way add to the outcome of the project (Wandersman, 2000)

Planting the garden

On May 21st, soils were turned in the two beds and the vegetables were planted in the garden. Figure 1.1 shows the two planted plots and the vegetables that were planted per square foot. Only vegetables were planted in the two beds due to high yield (the amount of food produced per unit area) which often comes from most vegetable varieties (Grewal and Grewal, 2011). I chose to buy plants at a local nursery and plants that were hardy for the area. I bought small, inexpensive starter plants so that I could keep the cost of my garden at a minimum. There were only a few plants that I started from seed due to the lack of their availability in seedling form. I grew the following:

- 10 tomato plants: 2 'Green Zebra,' 2 'Brandywine,' 1 'Lemon Boy,' 1 'Golden Jubilee,'
- 12 pepper plants: 6 jalapenos and 6 green bell, 'Big Bertha'
- 8 cabbage plants: 4 green 'Late Flat Dutch' and 4 red 'Red Acre'
- 8 kohlrabi plants: 'Grand Duke'
- 36 beets-mixed colors (red, Chioggia, white and gold)
- 4 Brussels sprouts
- 2 eggplant: 'Dusky'
- 1 summer squash

The garden beds were mulched with straw through the summer months for water conservation and required less labor spent on watering and weeding. The square-foot gardening method is planting many plants in a square foot without rows in the bed so this method of planting requires less labor as well. The crops were raised without the use of pesticides and fertilizers which means the input here was minimal.

Garden Plot Design at the Hawley Hamlet

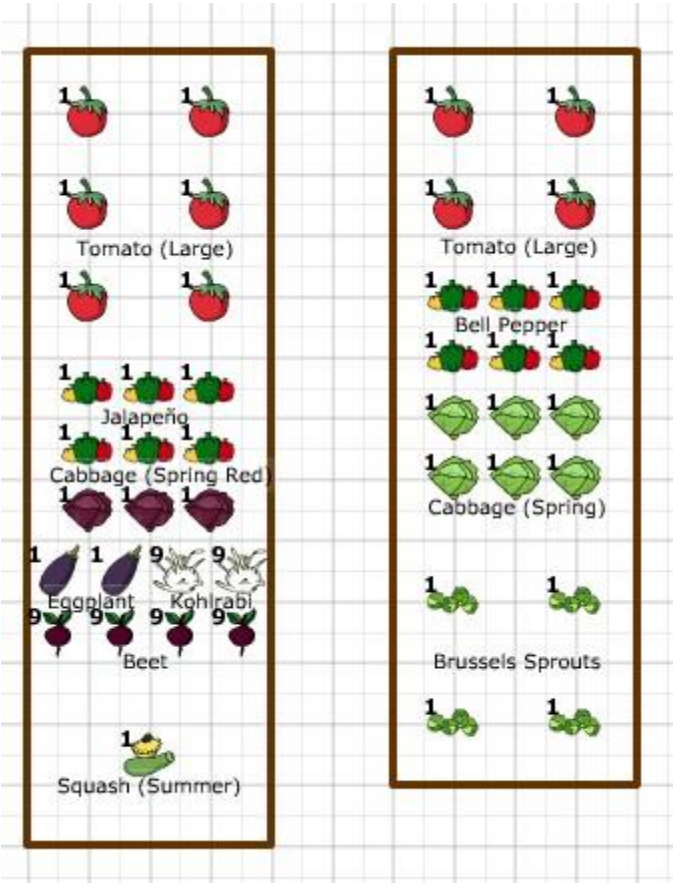

Figure 1: Representation of the garden plots planted in the square foot gardening method at the Hawley Hamlet Neighborhood Garden indicating how many plants per square foot (100 square foot garden)

Results

The vegetable output (pounds) and cost (dollars) savings in 100-square foot of garden space and were indicators used on what may be grown in a backyard garden or community garden. Using square-foot gardening as the planting method, stakeholders can grow as much as they can in limited space and utilize every foot of space. This method saves on time in the garden by requiring less time for weeding and need for water (Bartholomew, 2005).

At the end of the growing season, the yields were compared with the pricing at three local grocery stores – two traditional grocery stores and one organic grocery store. Table 1 shows the pounds of vegetables grown along with the estimated savings at each grocery store. The cost in plants and supplies when the garden was initially planted was calculated at approximately $100 ($1.00 per square foot). The value in the output of the garden is approximately $497 ($5.00 per square foot) for the season after the input was factored in and all three stores were averaged together. Examining the savings while looking at the organic grocery store example: the saving up to $619. Comparatively, the savings for the non-organic stores averaged together came to $537.

Calculating the yields showed certain crops like peppers and tomatoes are at higher value than others although growing conditions, availability of water, and other factors potentially change yields. All harvesting and weighing came to an end after the first frost and some vegetables still thrived after but were not included in the final calculations. 2016 was the first year that yields were quantified from the Hawley Hamlet Garden and future research is needed to show intra and interannually potential savings intra a continued savings within the garden and on specific crops that are valued more than others.

The first 2 to 3 weeks in the garden, the time spent on watering and weeding was more labour-intensive until the plants grew in and shaded the soil. The approximate time spent on the plots weekly amounted to 1 to 2 hours. Harvesting and weighing the vegetables took up the most time. Mel Bartholomew (2005) calculated that sixteen square feet (1 block) is approximately one hour of maintenance time per week per person in the garden.

Table 1: Cost per pound of the organic crops grown at the Hawley Hamlet Neighborhood garden relative to grocery stores prices in HyVee, Super Saver and Open Harvest

	Super Saver			HyVee			Open Harvest		
Crop	Yield (lb) (100sq/ft)	Price ($/lb)	Total ($)	Yield (lb) (100sq/ft)	Price ($/lb)	Total ($)	Yield (lb) (100sq/ft)	Price ($/lb)	Total ($)
Tomatoes	165	1.48	244.20	165	1.48	244.20	165	1.99	328.35
Bell Peppers	3	0.77	9.46	3	0.98	2.94	3	1.29	3.87
Jalapenos	21	1.28	26.88	21	2.88	60.48	21	6.00	126.00
Eggplant	10	1.78	17.80	10	1.98	19.80	10	1.99	19.90
Kohlrabi	2	none	0.00	2	4.98	9.96	2	3.98	7.96
Green Cabbage	9	0.66	5.94	9	0.87	7.83	9	1.49	13.41
Red Cabbage	8	0.68	5.44	8	1.47	11.76	8	1.49	11.92
Beets	41	2.52	103.32	41	3.10	127.10	41	1.99	81.59
Yellow Squash	35	1.47	51.45	35	1.98	69.30	35	1.99	69.65
Brussels Sprouts	19	1.98	37.62	19	0.98	18.62	19	2.99	56.81
Savings			502.11			571.99			719.46

Discussion

The year 2016 represents the first year of yield assessment in the Hawley Hamlet Neighborhood Garden. Factors that can limit or affect crop yields are the variety, and management of biotic and abiotic environments. For example, the bell peppers and tomatoes experienced a reduction in yields – due to disease, and spider mite, respectively at the end of the season. The garden is open to all the neighbors and the public which means some harvest could not be represented due to the occasional snacks by garden visitors (this is true for the Hawley Hamlet) (Gittleman, et al., 2012). Harvesting and weighing of crops included all the produce even if it was not up to grocery store quality. For example, the bruised and cracked tomatoes or sun scalded peppers were weighed and accounted for. All potential food coming from the garden was included in the yield calculations.

One common criticism of comparing cost savings of community garden output to retail prices is that the labor by gardeners is not factored in (Algert, 2014). Urban intensive farming requires more labor when compared to conventional agriculture and when this is considered the cost of produce could be higher. Practices such as vertical gardening and the square foot gardening method are new garden techniques that require less work by the participant while producing more vegetables per square foot. When consumers and stakeholders become more reliant on UA, then the costs could potentially decrease. On the other hand, health benefits and gains from increased food quality and physical activity are not incorporated in the cost-benefit assessment. There are many beneficial reasons for UA, and it differs for all stakeholders but as mentioned above: food security, community building, environmental impacts, and health are motivators for it. Future economic studies can target these factors.

Case studies in San Jose and New York City

Researchers have suggested that biointensive methods more closely resemble what community gardens practice rather than large-scale industrial farming. Data from the USDA on conventionally grown crop production using commercial farming methods indicates average yields of about 0.60 pounds per square foot for most vegetables produced in the United States. Biointensive farming, a common form of intensive gardening, focuses on improving soil quality and organic, high yield methods produces approximately 0.83 to 0.95 pounds of vegetables per square foot (Jeavons, 2006). Community Gardens in San Jose, CA averaged 0.75 pounds per square foot and the average savings was $435 ($1.53/lb) per plot for the season. The plots varied in sizes from 100 to 600 square feet and the yield was calculated through a four-month period. Results indicate that the community gardens in San Jose practices were closer to biointensive farming techniques. (Algert, 2014). New York City Community Gardens were able to grow an average of 1.2 pounds per square foot with an average savings of $3.00 per square foot (Gittleman, 2012). New York City gardeners also weighed pounds per plant in addition to pounds per square foot which gives a closer value to individual crops as tomatoes, cucumbers and peppers. Tomatoes averaged 4.14 and 4.6 pounds per tomato plant respectively, with each plant occupying 1- 4 square foot. Vegetables such as tomatoes, cucumbers and beans will produce more per square foot when grown vertically giving them a higher value per square foot because of the growing method.

The Hawley Hamlet garden exceeded the USDA's average of conventional and biointensive farming with 3.13 pounds per square foot and an average saving of $1.59 per pound with an average savings of $497 for the two garden plots in the 2016 case study. The cost savings here is greatly affected by crop commodity that is grown: tomatoes and peppers are more expensive than other crops (table 1) and typically produce more pounds per square foot. In this study only pounds per square foot were documented. Greater accuracy may come from size of plot dedicated to one specific crop but most home gardeners and community gardeners will plant may crop varieties because it is the only space available to them. Though there are many reasons for UA, tabulating savings per square foot is the beneficial for stakeholders with limited space for gardening. Weighing per plant is ideal in urban agricultural business when large-scale production is brought to the city.

Self-reliance in Cleveland, Ohio

Cleveland, OH, a population of 431,363 in 2009, had 50 acres devoted to community gardens generating between $1.2 and $1.8 million worth of fresh produce annually and their expenditure of fresh produce was $89 million a year (US Census Bureau, 2009; Masi, 2008). Therefore, evaluating the community garden output, Cleveland was about 1.7% self-reliant in fresh produce. It was estimated that 7498 acres of conventional urban gardening or 1666 acres of intensive urban gardening was needed to meet 100% self-reliance in fresh vegetables (Grewal and Grewal, 2011). Comparatively, Lincoln, NE, with a population of 272, 996 in 2014, has fifteen community gardens occupying over 1.5 acres of land (US Census Bureau, 2014; Lincoln-Lancaster County Food Policy Council, 2016). Public and private lands for UA opportunities were assessed and identified that 33 acres of potential land is needed to meet 1% self-reliance in fresh produce for Lincoln, NE (Mayor's Environmental Task Force, 2016).

Conclusion

Though there are many reasons for UA, quantifying crop yields is a way to promote UA and demonstrate what can be done at the local level in food production for self-reliance. The yields found at the Hawley Hamlet case study reflect what has been found at the community gardens in San Jose (2014) and New York City (2012) and had larger yield in pounds per square foot but that was due to crop selection. The findings in savings between San Jose and Lincoln were similar when the overall average was compared.

The Hawley Hamlet Neighborhood Garden serves as a model of what can result from a backyard garden or community and will demonstrate intensive urban gardening for promotion of self-reliance in the city of Lincoln. Quantifying food provides policymakers with information about the influence that UA can have on the local economy. The Mayor's Environmental Task Force and the Lincoln-Lancaster Food Policy Council are working towards the awareness of UA in Lancaster County and informing the public and policymakers of it's important role in the community.

Through food production and utilizing newly discovered urban resources, UA will contribute to the global food security in the face of increasing human population (Armstrong, 2000). With further study and growth, gains in local economics can start in backyards, community gardens, rooftops, or anywhere a stakeholder can take part in UA. The long-term goal is seeking the potential of growing food for self-reliance and the savings that can be obtained. Finally, localization of food will also require government involvement, public commitment and labor to achieve local economic security (Grewal and Grewal, 2011). Even if a city is not 100% self-reliant, it is worth the potential benefits that come from local food production.

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