ABSTRACT
Permaculture is a system of ecological design that aims to create more sustainable communities: its principles reinforce to participants understanding patterns of nature, learning food production, managing water catchment and storage, utilizing renewable energy, and building communities. A permaculture system is the exemplary sustainable approach to food production systems that the Campus Garden aims to bring to the University at Buffalo. Using the framework “Grow better, not bigger,” the ultimate goal of this research is to double the amount of food production to forty-pounds, in the same 20’x20’ plot of the UB Campus Garden. To advance the Garden’s vision and further emphasize the importance of sustainability, it is our goal to explore different gardening techniques for implementation during the growing season. We aim to educate individuals on gardening techniques, prove that implementation of these techniques is plausible at various sites, and expand the understanding of the importance of food production.

COMMUNITY ENGAGEMENT
To better engage the UB community it was important to gather baseline data of the UB community’s understanding of the Campus Garden. The group distributed an electronic survey to the UB community over a period of four weeks, questioning individual knowledge of the work at the campus garden. We obtained the following results:

Of 745 Respondents-
97% Have not heard of and did not know location
97% Have not volunteered
86% Did not know CDSS uses herbs from the Garden
75% Agreed it is important UB improve Sustainability
76% Agreed it is important to know Source of Food

Sustainable Approaches to Food Production
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PERMACULTURE TECHNIQUES
Application of permaculture principles allows for maximum growth potential in the 20’ x 20’ garden plot. Using aspects of a permaculture system we begin to create a more sustainable and prosperous food system. The main permaculture techniques being tested are companion planting and guild creation. Plant guilds are a beneficial grouping of plants that support each other in different ways. Some of the ways the plants support each other are exchange of nutrients, physical buttresses, and by promoting diversification. [1] Plant guilds are created by using companion plants. Companion plants are plants that can be grown together in the same area that will allow both plants to flourish in ways they otherwise would not if planted by themselves. In our research, five different plant guilds are created to evaluate the principles of permaculture.

VERTICAL GARDENING
The use of vertical gardening maximizes the given space to produce a greater amount of food with better efficiency and ease of harvest. The technique this project focuses on is through different variations of potato towers. Displayed are two designs; using these we will compare the potato production in pounds of yield at the end of the growing season. Potatoes planted straight into the ground are difficult to harvest as they require a large amount of space with little production. Potato towers bring the process above ground for ease of harvest and a maximum production/space ratio. As the potatoes grow, the roots will show above ground and will need continuous soil addition until plants reach the top of the tower.

The first method is a wooden tower that is reusable. A wooden frame is built with an overall dimension of 3 x 3 x 3.5 feet. This gives space between each potato seed and a height that will accommodate total potato production. Conventional potato towers will screw wooden boards to the frame as the roots grow upward. For a more sustainable approach, our potato tower will allow a wooden board to slide in and not be permanently attached to the frame. This allows easier dismantling for harvest and less damage to the frame.

The second method is a wire-frame potato tower. This method is less expensive and requires less experience with woodwork. This uses metal fencing to create a cylinder with a 4 foot base and 4 feet high. This gives stability to the fencing and space for growth. To prevent the soil from falling through, hay will be placed as a barrier around the cylinder. The soil layering process is the same as the prior tower.

CONTAINER GARDENING
Container gardening allows for an increase in productivity while optimizing the available planting space. This method focuses on growing annual vegetables in various containers positioned around the perimeter of the garden plot, to analyze the effects of companion planting techniques and how different container types effect growth. Utilizing two types of containers, wooden-rectangular and plastic-round, we will plant two groupings of plant species. The first plant combination includes peppers, tomatoes, onions, and geraniums. The second plant combination includes cucumbers, eggplants, lettuce and marigolds. Keeping the types of plants constant on two sides allows for evaluation of the overall productivity of the plants grown in different containers. The vegetables were grouped based on the principles of companion planting which proves to enhance growth and create an integrated pest management system.

HERB SPIRAL
Creation and inclusion of an herb spiral at the Garden is a technique for increasing herb production for use by Campus Dining and Shops at the University. The design allows for multiple micoclimates to exist while using gravity and natural sunlight patterns to provide optimal growing conditions for many herb varieties. [4] The herb spiral will include dill, cilantro, sage, lavender, sweet basil, chives, French parsley, oregano, thyme, rosemary, peppermint, sweet marjoram, chamomile, Russian tarragon, coriander, and comfrey.

REFERENCES

Wooden Tower Structure
Metal Mesh Structure

Image 1: Wooden Tower Structure
Image 2: Metal Mesh Structure

Image 3: Representative cross section of the herb spiral design from the spiral approach.