

Pope Farm Expansion Project Proposal

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Background and Objectives

The Maryland-National Capital Park and Planning Commission (M-NCPPC) is a nationally recognized organization that acquires, develops and maintains land for public use. It protects natural resources to ensure sustainability and plans for communities to flourish and grow so in a way that is as accessible, sustainable, and livable as possible. M-NCPPC plays a significant role in the well-being of Maryland residents in the capitol region. It ensures a high quality of land and green spaces used for recreation and health, and now, land used for distributing fresh produce to less privileged residents. At Pope Farm in Gaithersburg, M-NCPPC grows plant material for Montgomery County parks in using efficient practices that don't exploit or damage the land, and, most recently, to generate a high yield of high-quality foods.

In 2020, Pope Farm donated approximately 4,500 pounds of food to Montgomery County residents through a new partnership facilitated by M-NCPPC's Community Gardens program. They worked with HarvestShare, a non-profit organization that aggregates and delivers produce from farms and community gardens to donation centers and food banks where it can reach food insecure residents. This year's goal is to donate 9,000 pounds of produce to diverse residents of low-income communities who lack access to fresh produce.

The INAG248 student team was matched with M-NCPPC and Pope Farm by the Partnership for Action Learning in Sustainability (PALS) program at the University of Maryland, College Park. We were tasked with developing a planting plan that would help the partners implement this initiative and reach the donation goal.

The team developed a planting plan that includes diverse vegetables and crops that will benefit the community. By growing and sharing familiar crops recipients will be able to use them appropriately to feed their families. We also considered the harvesting and transportation of these foods. Since the farm serves as a nursery for Montgomery County parks, they are accustomed to growing trees and have machinery suited for large-scale plant production; this was considered in creating the recommended planting plan.

Overall, we considered Pope Farm's and HarvestShare's resources for growing and distributing these foods to surrounding communities.

Site Analysis

The production garden site is about 8,000 square feet—much larger than a small, backyard vegetable garden. The team developed an initial plan that was adjusted after a site visit. The farm

equipment is much larger than we initially understood, which calls for wider aisles between beds. The farm also prefers low maintenance crops with minimal labor, which called for us to adjust our potential crop list.

The initial plan focused on closely planted crops planted to maximize the yield. The plan also grouped crops by plant family for an easier harvest. However, after the site visit, viewing the farm's machinery, and discussion with the farm staff, we adjusted the plan. The machines require wider rows, so we lowered the number of rows and reduced the types of crops from the initial plan. We began to focus on crops that would contribute weight toward the goal, rather than variety.

Soil Health

Pope Farm runs regular soil tests to monitor nutrient and mineral levels suited toward tree planting. We added the nutrient requirements of each proposed crop. We didn't do further investigation since the Pope Farm team has a strong understanding of their soil needs and experience to manage the soil.

Crop Production Methods

In creating the initial crop plan the team considered a variety of produce that would be diverse and appeal to the community. We had a rough idea of the planting area size but were unclear about the exact spacing and machinery Pope Farm had for the project.

Crop	Yield per 100' row	Start Planting Date	Location	DS or TP	Seed or Plants per 100' Row	Plant Family
bean (pole)	80 lb			DS		Pea- Fabaceae
beets	40 lb greens; 65 lb roots	Apr 1-June 15		DS	2 oz	Spinach - Chenopodiaceae
broccoli	50 lb	Apr 1-May 1		TP	67 plants	Cabbage- Asteraceae
cabbage	150 lb; 60 heads	Mar 15-Apr 10		TP	100 plants	Cabbage- Asteraceae
cabbage	150 lb; 60 heads	Mar 15-Apr 10		TP	100 plants	Cabbage- Asteraceae
carrots	150 lb	Apr 10-June 1		DS	1/2 oz	Carrot- Apiaceae
cauliflower	80-120 lb	Apr 1-May 1		TP	67 plants	Cabbage- Asteraceae
celery		Apr 15- May 1		TP	300 plants	Carrot- Apiaceae
cucumber	120 lb	May 10-June 1		DS	1/2 oz	Cucumber- Cucurbitaceae
eggplants	200 lb	May 15-June 10		TP	67 plants	Tomato- Solanaceae
garlic	50-90 lb	Mar 15-Apr 15		DS	400 cloves	Onion - Amaryllidaceae
onion (bulbing)	140 lb	Apr 1-May 1		TP	400 plants	Onion - Amaryllidaceae
onion (bunching)	100 lb	Apr 1-May 1		TP	400 plants	Onion - Amaryllidaceae
parsley		Apr 1-May 1		DS	1 packet	Carrot- Apiaceae
peas (fresh)	25 lb	Mar 15-May 1		DS	1/2 lb	Pea- Fabaceae
peppers	20-80 lb	May 15-June 10		TP	67 p;ants	Carrot- Apiaceae
potato	60-150 lb	Mar 20-May 10		DS	8 lb	Carrot- Apiaceae
rutabaga	150 lb	July 1-Aug 1		DS	1/2 oz	Carrot- Apiaceae
summer squash (zucchini)	200 lb	May 1-May 30		DS	1 oz	Cucumber- Cucurbitaceae
summer squash (yellow)	200 lb	May 1-May 30		DS	1 oz	Cucumber- Cucurbitaceae
sweet potato		May 20-June 10		TP	100 plants	Convolvulaceae
tomatoes	150-450 lb	May 1-May 30		TP	67 plants	Tomato- Solanaceae

The chart above list the initially recommended crops and how much they might yield. We included the planting dates and plant specifics. However, after the site visit, we changed the initial plan to lower the number of different crops and focus on reaching the goal weight of 9,000 pounds.

We strategically placed the crops to get the best yield. We did this to introduce the most efficient way of planting the crops and for the most efficient harvesting time. The spring planting dates for most of the crops start in mid-May. The correct width was chosen for each type of plant. The plan also records the most likely pests for each crop, so farmers can keep them in mind.

The crop production list was based on the Montgomery County's Food Council's *Gap Analysis and Action Plan Report* and their 2019 *Culturally Appropriate Food Access Survey*. As a spreadsheet, it includes three sections: 2021 crop production list, 2021 crop production projected yield (based on the 2021 crop production list), and a future crop production estimate (a more expansive crop list).

The 2021 growing season crop production includes cabbage cucumber, eggplant, onion, peppers, potatoes, and winter squash. The spreadsheet includes information for each crop:

- plant family
- spring and fall planting dates
- yield per 100-foot row
- cultivation information (planting space, recommended Integrated Pest Management, nutrient requirements)
- harvesting information.

Columns C through G and column K records information such as plant variety, already have or purchase, location/plot number, seed source, and greenhouse planting date (to be filled out by Pope Farm staff).

Key: DTH= days to maturity; GH = greenhouse; DS = direct seeding; TS = transplant; IPM = Integrated Pest Management												
Crop	Plant Family	Spring Planting Date	Days to Maturity	DS or TP	Plant Spacing	Seed or Plants per 100' Row	Yield per 100' row	Pests	Recommended IPM	Nutrient Requirements	Harvesting	
cabbage	Cabbage- Asteraceae	Mar 15-Apr 10	52 days	TP	18-30" between rows; 8-12" apart in row	100 plants	150 lb; 60 heads	worm grey/b	ms/chives seeds tr	nitrogen fertilizer	in a near-freezing, humid cool	
cucumber	Cucumber- Cucurbitaceae	May 10-June 1	48 days	DS	48-60" between rows; 18" apart in row	1/2 oz	120 lb	old/rot; aphid	prevent fungus, chiv	high phosphorus	numbers at 45-50°F (7-10°C)	
eggplants	Tomato- Solanaceae	May 15-June 10	58-70 days	TP	30-42" between rows; 24" apart in row	67 plants	200 lb	eebles/worms;	ms/chives seeds tr	balanced fertilizer	fruits of desired size regularly	
onion (bulbing)	Onion - Amaryllidaceae	Apr 1-May 1	104 days	TP	15-24" between rows; 6-8" apart in row	400 plants	140 lb	nematodes; ro	vent nematodes we	nitrogen fertilizer	protected location to finish d	
peppers	Tomato- Solanaceae	May 15-June 10	green; 70-80	TP	30-42" between rows; 18-24" apart in row	67 pants	20-80 lb	ot; aphids, cater	seed hand pick/c	balanced fertilizer	to encourage further fruit set.	
potato	Tomato- Solanaceae	Mar 20-May 10	mid-season: 80	DS	30-36" between rows; 12" apart in row	8 lb	60-150 lb	nematodes; rot	olds and well drain	assium and phosph	leave tubers in the ground for	
winter squash (Acorn squash)	Cucumber- Cucurbitaceae	May 15-June 15	50-55 days	TS	60-84" between rows; 36-48" apart in row	1 oz.	200 lb	ms/beetle	milhen young, proper	balanced fertilizer	vines and handle carefully. S	

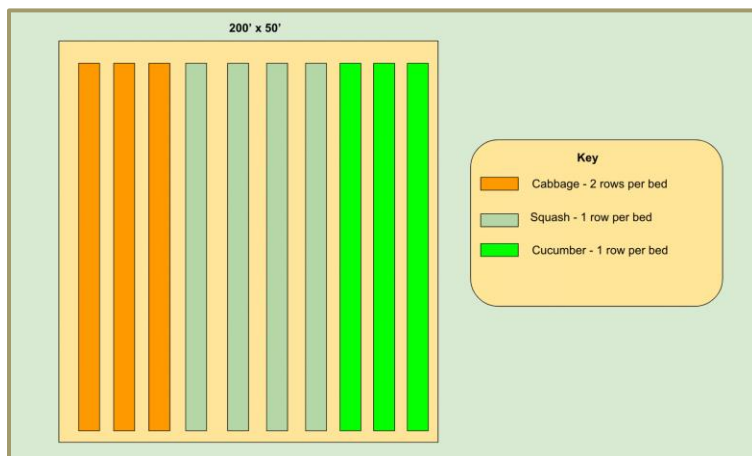
In addition to the two existing plots a permanent plot of asparagus is recommended. Asparagus is a perennial and takes two years from planting for the first harvest.

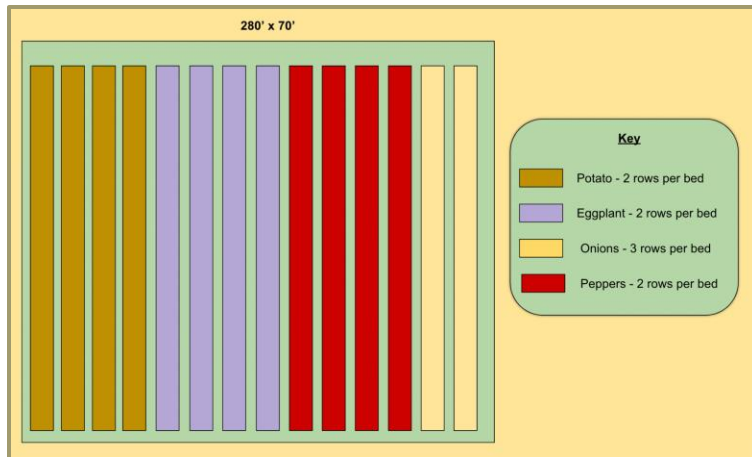
The 2021 projected yield is based on the garden design. It includes:

- number of beds per crop
- number of rows per bed, per crop
- number of 200-foot row per crop
- total row-feet of each crop
- crop yield per 100-foot row
- yield per crop in pounds
- total yield of all crops in pounds.

The total projected yield surpasses the goal weight of 9,000 pounds.

Crop	# of Beds	Row/bed	# of 200' rows	Total row per foot	Yield per 100'	Total Yield (lb)
cabbage	3	2	6	1,200	150 lb	1,800
cucumber	3	1	3	600	120 lb	720
eggplant	4	2	8	1,600	200 lb	3,200
onion	2	3	6	1,200	140 lb	1,680
pepper	4	2	8	1,600	80 lb	1,280
potato	4	2	8	1,600	150 lb	2,400
squash	4	1	4	800	200 lb	1,600
					Total Yield (lb):	12,680





Crops are assigned to each plot by scientific plant family to facilitate integration into the larger farm's crop rotation and makes it easier to spray if needed. Potatoes and onions are assigned to the plot's edges for easier harvesting.

County Food Security Analysis

Montgomery County is one of the nation's most diverse communities and the team considered the demographics of its residents in determining the type of crops that the residents can use and enjoy. Growing produce that people don't know how to cook makes it more likely it won't be used. To prevent this waste the team developed a crop list based on our research into the county residents: garlic, onions, tomatoes, peppers, potatoes, sweet potatoes, summer squash, carrots, celery, parsley, beets, peas, beans, cabbage, rutabaga.

Demographic and Economic Analysis

Of the County's 1,050,688 residents, about 8 percent (83,208) are food insecure. The demographic analysis is divided into four categories: 60 percent White, 20.1 percent Black, 20.1 percent Hispanic/Latino, and 15.6 percent Asian. The center of the County is the most diverse area, with no one group leading and a majority of foreign-born population in these areas. Residents in this area, also have the lowest median income in the county. Knowing this, we found that this most diverse area, with more immigrants, feels the most financial and food insecurity.

The most food insecure communities are East County, Wheaton, Silver Spring, Gaithersburg, Aspen Hill, and Germantown. Groups in these areas are disproportionately affected by food insecurity, which is highly influenced by economic factors. Most foreign-born residents are from Asia, Latin America, and Africa.

COVID-19 Impact

Before COVID-19, food insecurity was the lowest it had been since the Great Recession, though still at 37 million people across the US. At the start of COVID-19, 14 million people were put out of work, leading to significantly reduced or no family income. It's estimated that, due to the pandemic, 17 million people in the US could become food insecure, meaning more than 54 million people, including 18 million children, without regular access to food. Also, due to the pandemic, the gardens and farms that have delivered in person has reduced significantly.

Because the pandemic has made it difficult to directly deliver food, the team developed options to deliver collected produce to residents in need:

- car pick-up, where people drive-up to receive food in their cars
- car-less pick-up, where people pick-up pre-made donation boxes through a door or a turning system to reduce contact
- delivery system, where people can register their address and receive food at their doorstep.

Culturally Appropriate Foods

The top three groups most likely to need food assistance are Black, Hispanic, and Asian. These groups can be further divided into ethnic groups based on the county's foreign-born populations, people from El Salvador, China, India, Korea, and Ethiopia.

The team researched popular recipes in these countries to see what kinds of vegetables Pope Farm might grow. El Salvador's most traditional dish is pupusas, a traditional Chinese dish is hot pot, in India a traditional dish is butter chicken, Koreans prepare kimchi, and a traditional Ethiopian dish is doro wat. Suggested crops based on cultural culinary traditions are garlic, onions, ginger, cabbage, radish, spices like turmeric, cardamom, coriander, chiles, mung beans, mushrooms, bok choy, carrots, and oregano.

However, after a site visit, the team concluded that several of those crops aren't suited to the climate or the space. Pope Farm should grow cucumbers, eggplant, onion, pepper, potato, and squash due to their versatile uses in these recipes and others from different cultures. The foods should meet the needs of many people in Montgomery County because of its highly diverse demographic in target areas. The projected yield is 12,680 pounds, surpassing the goal weight of 9,000 pounds. This excess yield can be used to aid those who have been affected by COVID-19.

Conclusion and Recommendations

The PALS Pope Farm project has been an enlightening experience for the student team. On-site field trips and the online lectures have sparked creativity during an online semester. The Pope Farm

model and target to double its donation of 4,500 pounds of fresh produce through HarvestShare to support food security in the county during the COVID-19 pandemic can be applied to other communities in the US where millions of people face food insecurity every day.

The crop plans detailed how the harvest can double the amount of fresh produce donated, but the soil quality is essential if this garden is to thrive. We hope the future of Pope Farm remains community-based and sustainable.

The team's findings, presented to Pope Farm, HarvestShare, and other affiliates prompted a discussion about the future of this project. Pope Farm has already begun preparations and planting for the 2021 season. The team's detailed information will help implement the program and provide a reference resource if the farm chooses to grow the crops investigated by the team.

We look forward to seeing this project continue and provide food for the community.