Smith Gardens Internship
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Upon putting together this assessment of my internship, I have come to realize many things. First and foremost, it has become vividly clear what an amazing opportunity I have been granted, an opportunity that I have grown increasingly grateful for as my six months of work has quickly approached an end. I am ever appreciative to my personal advisor Dr. Paul Thomas for setting me up with this opportunity, to the faculty of the A.F.E. who have directed the Vic and Margaret Ball Scholarship program, to my AFE advisor Candice Musgrove who has coordinated my success with the program, to Vic and Margaret Ball for their exceptionally generous dedication and donations made to create an opportunity like this for a young individual such as myself, and to everyone at Smith Gardens who has opened their arms to me, giving me a place to learn and better myself for my ensuing career. Although this is a group of people who may not even know each other on a personal level, they have passionately collaborated together with the common purpose of leading myself, as well as other aspiring students, to be successful. While words cannot describe my appreciation, I extend a thank you to you all. You have provided a means for me to achieve my goals in the floriculture industry, giving me a leg up on a dream that at one point I consider a steep climb. This opportunity is so much more than the scholarship money I will receive for my efforts, for I have obtained knowledge and confidence valued far higher than what money could buy. Six months ago, I embarked on a journey across the country embattling a sense of nervousness, a fear of failure. After all, I do not come from a background of horticulturists, nor had I accrued the type of experience one would come to expect from an aspiring floriculture student. Truthfully, I did not know what to expect when I got to Smith Gardens, and there was an apprehension of not meeting expectations. In hindsight, I shouldn’t have been so nervous. In present times, it has become clear the faith you all had in me, but it wasn’t until I got started with my work that I could see this. And, because of your faith in me, I got an opening to prove myself not only to you all or to future employers, but to myself. I don’t know if you all realize to the extent that you have built me up, not only because of the knowledge I have gathered about the floriculture industry, but because of the
chance you gave me to show myself that I was capable of achieving my goals. In the letter I wrote to the AFE, I emphasized my desire for an opportunity, and I am proud to say that I have capitalized on this opportunity; I couldn’t have done it without you all!

Lean/Continuous Improvement

At Smith Gardens, we have adopted the LEAN program implemented by several large, profitable businesses such as Toyota. The idea behind LEAN is cutting out wastes, which have been distributed into seven categories defined by the acronym T.I.M.W.O.O.D. (transportation, inventory, motion/movement, waiting, over-production, over-processing, and defects). Transportation highlights that moving a product does not increase the value of the product, and that it is an expensive process. Inventory represents work-in-progress or finished goods. These are products that exemplify a cost that has not yet produced an income. When workers have to bend, reach, or walk a distance to complete their job, resources are being unexploited. The production process can cause inconveniences to the people who create the products, which correlates with the motion/movement waste. Waiting is the next waste, and this occurs when one process is delayed starting due to another process not being completed yet. We also have the waste of over-production, which is producing more than what is needed in turn generating excess inventory. Following this is over-processing. This refers to doing more work to something than is required for the customer. And lastly, we have defects. Defects are any products that require reworking or a product that is simply no longer saleable and needing to be thrown away. All of these wastes pertain to every department; daily, weekly, and monthly meetings are
held to ensure that our processes are done by the most efficient means because this system is an all hands in system.

Coinciding with LEAN is the idea of Continuous Improvement, which is a very important concept that we have adopted at the Smith Gardens facility. In fact, Smith Gardens has appointed a Continuous Improvement leader in Andres with the responsibility of coaching better work practices amongst all of our site locations. The idea of continuous improvement (or C.I. for short) is to avoid plateauing in your work practices. One should never assume that they have discovered the only way to do something, as they should strive to improve in every aspect of their work. This corresponds with LEAN because you should always be aware of where you may be contributing wastes. Instead of being comfortable in your traditional procedures, you must be willing to expand your horizons. There is a process known as PDCA (plan, do, check, act) that is a cycle to better your work. The idea is that if you consistently diagnose your work, you can determine the aspects in which you are lacking or creating wastes, therefore highlighting the areas in which you need to eliminate or fine-tune.

Here at the facility, we create standard work based on our efforts to create LEAN work for everyone. Standard works consists of our devised plan of how every task should be carried out, and is documented and made available for everyone to see. Although, these standard works are subject to change as the PDCA process takes place and illuminates changes to our standard processes. With the implementation of standard work, we dissolve uncertainties an employee may have that could create wastes. If everyone works in the same systems, the flow of work runs smoothly, and the transition of work between co-workers and departments is without
conflict. An example of this could be seen in dry goods inventory. Because we wrap our pallets a certain way, label them a certain way, and store them in a specific location, there is a minimization of perplexity when it comes to finding this dry inventory regardless of who may be finding it, as it is listed (with pictures) in the standard work sheets. These are available through the computers and are also conveniently posted in work space areas pertinent to the work done in said area. Visual controls are crucial at the facility and are created to be easy enough to comprehend that someone new to the job can quickly and efficiently carry out a task they are provided.

Lastly, it is important to touch on preventative maintenance that we do at the facility. Traditionally, one might use equipment or tools until they can no longer be used, which at first seems to make sense. Preventative maintenance is implemented to preserve the length in time of which said equipment or tools can be use, as well as prevent delays in work because of a malfunction. Something exemplary of this method would be doing routine checks on our soil mixing machines. If we check can catch a fault in our machine before we are operating the machine, we can prevent that fault from happening while the machine is in use. Even if it is a small fault, we would rather tackle the issue first thing rather than have it halt our production processes mid-day, for this would create many wastes.
Planning

The planning department can be very stressful throughout the season because it involves a lot of patience due to constantly having to mend your plans for a multitude of reasons. In a facility such as Smith Gardens, you are working with anywhere around a million square feet of space, not to mention the roof where you will also be hanging baskets. I worked with Elizabeth in this department, and she did her planning through a Microsoft Excel document that was linked to the PICAS inventory system that is used across multiple departments. This is to ensure that data can be accurately transferred to everyone involved in the life cycles of the plants at the farm, whether it be the production manager, the inventory directors, or even the people at the corporate office. A daily schedule for planning involves a lot of puzzles. There are fifteen greenhouses, eight hoop houses, eight field spaces, an off-site location that includes five more greenhouses, and a constant expansion of more field space and greenhouses seeing as Smith Gardens is a massive operation always in need of more space. On top of this, each area offers different environments. Most of Smith Gardens operates under heavy automation, but because of the timeline of upgrading each area there are differences in the amenities of each house. So, while planning, one thing to consider is the irrigation method of the house. Whether the house irrigates over head or from the floor plays a role in where you can put certain plants. Many varieties of plants will experience leaf or petal damage from watering overhead, so the flood floors would be better suited for these varieties. Also, some houses have more controllable climates for your varieties with more specific needs; some of the older houses (and obviously your field space) aren’t as equipped to maintain a certain temperature. With a crop like poinsettias, it is pivotal to maintain a warm environment with ample lighting in order to develop saleable plants. After you take all of this into consideration, you have to also consider time you need for the plant to develop and how much space is already available in what area, because after all in the industry of annuals you are constantly moving product in and out. It is a necessity to maximize your space.

Elizabeth had gone out and measured the available space of each greenhouse and field (when empty). Also, the measurements for each pot size at pot tight and during spacing was predetermined and linked into the PICAS sheet; this ensured that when Elizabeth inputted 30,000 flats of snapdragons into a certain house, it would match up the numbers with available surface area in the house. It is very crucial to have organization like this because it makes the process a whole lot easier. However, just because you have a plan set in place doesn’t always ensure smooth and easy sailing. In many instances, things happen for which we couldn’t account. One example of this would be a crop that has grown more rapidly than expected and is in need of being spaced sooner than originally planned. Ideally, your floor space is filled at all times to maximize available product. With that being said, spacing even a week early can produce an issue as you may have other crops in your spacing area that weren’t supposed to ship until the following week; now you have plants that need moved into a new spacing area that more than likely already had a different crop planned to be laid down or spaced here. As you can see, this creates a whole process of tweaking future plans to account for one overgrown crops needing to be fast tracked.
One means for incorporating the LEAN process into the planning department is to plan in a way that ensures the least amount of contact with the plants by employees. Every time someone touches a plant after it is laid down adds to the labor costs of the whole facility. With this in mind, Elizabeth is working with the production manager and the spacing manager to get certain crops laid down pre-spaced or at least cracked to prevent us from having to go back and rework the plants. If the crop can be spaced when laid down, we don’t have to designate a moving team to come space these plants later down the road. With that being taken care of, that same moving team can focus on other projects or dilemmas that arise, and the company can save time by cutting out wastes.

Production

One of the most intriguing processes I encountered at Smith Gardens was the production process. It is easy to forget that someone has to plant every plant that you find at your local garden center. Never could I have imagined the machinery and technology available for transplanting plugs and liners, but it makes sense when you take into account the massive numbers of plants Smith Gardens sells in a season let alone the whole year. On a daily basis, we have four plant assembly lines where transplanting of plugs and liners takes place. Although they are not all always running, in the busy season it is not unlikely for them all to be. The production manager coordinates with the corporate offices to determine our daily transplant totals, then relays this information to all of the line leads. A collaborative effort involving receiving of the living materials (plugs/liners) and the dry materials (pots, baskets, tags, soil) ensures the finishing of a final product that is the beginning of what we aim to sell to the customer.
Personally, I worked with each department that is involved in getting together all of our raw materials for our finished work. Whilst working with receiving, we focused on getting in orders of our materials and properly storing them where they belong: dry goods are stored in the designated dry good storage area and the plugs/liners are stored in the greenhouse with the properly designated environment for them to stay alive before transplanting. Another important department is soil mixing. At Smith’s, we just ordered all of the components of our soil (pine bark, micro and macro nutrients, Hydrafiber bales, peat moss, and any other additives that could be incorporated for specific mixes such as aluminum sulfate for hydrangeas) and we created our own mixes of soil. For the most part we used one mix, but for certain plants like the poinsettias or the hydrangeas we had a slightly different mix. All of these components are compiled together with a soil mixing unit designed by us to suit our facility. There is an Agrinomix peat moss shredder that begins the process by shredding a bale of peat moss and incorporating it into the pine bark that is loaded into the mixer. From here, the mixture travels by conveyor belt where all of the small components are dropped in, and eventually the Hydrafiber that we use in all mixes at Smith’s is shredded by machine and added into the soil. Conveniently, the conveyor belt then connects to each of the production lines where sensors tell the machine whether the soil needs replenished or if its full.

The production lines themselves are big conveyor belts where the pieces of the final product come together. Generally, around ten people operate each line, but this is variable dependent upon what we are transplanting that day. On the beginning in of the line, somebody loads up the pots we’re using for the day, which could be GL100, QT250, PK306, Tiles, or many other options. One thing to note is that each line has certain pots that it can use; for instance,
the PC31 line has a VISSER mechanical transplanting computer that only transplants into flats of packs. This machine can generate as many as 30,000 flats per day, each flat containing around eighteen plants. When you have a line that doesn’t have the transplanting machines, it is necessary to have somebody physically putting the plugs and liners into the pots. For some plants, you also have to have someone on the line to put tags on the pots. Eventually the plants make it to the end of the line where they are either loaded on the racks and tugged to their chosen location or picked up by specially designed VISSER fork lifts that can pick up numerous plants at a time and relocate them. After these lay downs, the plants are left in the hands of the growers.

**Growing**

My initial interests were to be involved in the growing process of the plants, and my role at Smith Gardens furthered that interest. But, I will say that it is quite different from what I expected. At a business as large as Smith Gardens, there is a lot of automation in place to ensure that things can be tended to at a very large scale. All of the fields and greenhouses are distributed into sections amongst the ‘sectional growers’, who are all governed by the assistant head grower Joe and the head grower Ian. I did work with each section grower as well as the two head growers.

![Greenhouse image](image)

Daily, the sectional growers are responsible for maintaining the plants in their areas, although they do have help from irrigators in the busy seasons as it gets to be rather much to handle. There are millions of plants that are grown here each year! Thankfully, those plants are
not all watered by hand. In fact, I would estimate that less than 5% are hand watered (not including spot watering). Most of the facility operates either under booms or flood floors. The booms are Cherry Creek systems and run from a computer attached to each boom. Some of our bigger houses have ride on booms while others have walk with booms. Also, being incorporated more and more into the houses are Erfgoed flood floors, but there are also concrete, cascading flood floors. The Erfgoed floors are interesting but seem to be very efficient for watering. The field spaces are overhead sprinkler irrigation that operate on the Baseline computer system. From any computer/tablet/smart phone (with the right credentials), anyone could turn on or off the sprinklers in any given section. You can also set up schedules to water every so often or however many days of the week you would prefer. Under glass, we have a few different means of watering.

Smith Gardens is gearing towards total automation with only one greenhouse currently running under drip irrigation without a computer system. The hoop houses, as well as a few of our greenhouses, use overhead sprinklers and they operate under Orbit computers. The Orbit system found at these locations consists of a box in the area with a control panel and a dial. Similar to Baseline, you can do manual waters to each area or set them up on a timer or a schedule. Our flood floors operate from our Argus system that we use. Within the central growers’ office, any sectional grower can operate Argus from the computer. It is nice because Argus is very in depth and shows you a lot more than the other computer systems. It overlooks all the areas, telling you the humidity, temperatures, scheduled waterings, VPD, which water silo you’re pulling from, and many other aspects of the area to give you a full synopsis of your houses. The head growers also use this system to determine where plants would be better suited throughout the year, which is then discussed with the planning department. Another very helpful system that I have become familiar with is PRIVA. There are boxes in many of the house for the PRIVA system that, like Argus, can determine humidity and temperature. PRIVA can be checked from the computer; it creates graphs that show numerous growing factors including light intensity with the greatest part being that it maintains records throughout the years to give you historical data for decision making. We use Argus and PRIVA to vent the houses, open the roofs, roll out shade curtains, to create ‘dips’ in the mornings, to maintain a certain temperature between a high and a low, and pretty much anything else you could think of: they are very useful.

Additional work required from the sectional growers is maintaining the health and size of the plants. While there is a need for fresh water waterings, most of the time we use fertilizer water that is premixed and runs throughout the whole facility. There is still a need for micronutrient boosts at times, and the growers are responsible for this. Also, it is required that we use growth regulators (such as Top Floor, B9,) to maintain plant size because we have to grow plants that look nice and compact for the customers, as well as be able to ship well by fitting on the shelves. Micronutrient applications and growth regulator applications are generally done with Dosatrons, which are devices designed to mixed your desired PPM of product in while watering. The booms are all equipped with Dosatrons, so as long as you can do your math right it is a simple process. It is also important to make sure the Dosatrons are all calibrated.
I find it very important that the head growers and the sectional growers do stay on the same page at Smith Gardens because plants are a delicate product and there is not much room for error. Weekly there are walks designated with the head growers and each section grower individually to discuss the areas and what needs to take place in the following week. There are also weekly meetings as a group to discuss scheduling, to ensure all areas are being maintained, as well as subjects such as EC and pH. Every week each sectional grower has to monitor the EC and pH of their area so we can ensure that the plants are in good health. For plants like the poinsettias, height tracking is also done and relayed at these meetings. We track heights of each variety to create graphs and compare them to previous years graphs to get an idea of whether or not we’re up to desirable size.

A department that is linked to the growing department that I was involved with was plant maintenance. This is the crew that is involved in any reworking of the plants. When it is time to space the plants so they don’t grow straight up, the crew is in charge of doing so. They also move plants that are no longer in a desirable area, whether it be because they need moved indoors because of the changing season or something as simple as needing the space for a different plant. On the maintenance crew, we also pinched plants, trimmed hydrangeas as well as took cuttings from them, did pot changes and added sheets to pots, relocated baskets from the floor to the roof, and generally any kind of reworking the plants may need.
Poinsettias

Mother’s Day is the busiest time of year for annual flower growers, but unfortunately I arrived to work shortly after this time. Although there were many crops witnessed throughout my tenure, the poinsettias were one of the biggest learning experiences gifted to me. We helped to develop this crop from start to finish, giving me good insight as to what it takes to create a saleable, good crop. It is quite different from the rest of the year because of the primary focus being one genus from July to November. Conversely, it is important to note that each variety has mildly different care needs, and we grew approximately 15 different varieties not including our trials. Each stage of life was studied starting with sticking cuttings (calloused cuttings and Oasis cube rooted cuttings). Rooting is a very important stage of life because roots are necessary for water and nutrient intake; right after sticking we sprayed an I.B.A. and non-ionic surfactant (Capsil) onto the stuck cuttings to encourage root development. We began our poinsettias in our bigger green houses where it was necessary that we draw our shade cloth to maintain the heat and humidity inside the house: this discourages wilting and stretched growth. For the first twelve days of their life cycle, we misted the poinsettias with overhead misters on the booms (using fresh water until they had developed a little more). After around a month, we pinched the poinsettias to promote more breaks; the end product we desire has a fuller more compact look as opposed to a tall, single leader look that most poinsettias naturally grow into. Also, around this time is when we began spacing all of the pots, as they are typically laid down pot tight (no space in between pots). Once we had good root development (closer to the bottom of the pot), we preferred to water them with the flood floors. When you water from the ground up, it causes less burn on the leaves and bracts down the road. If we had to water overhead, we would do several passes with fertilizer water, then a few finishing passes with fresh water in order to wash off some of the leftover salts from the fertilizer on the leaves and bracts, minimizing chance for damage. Initiation of bracts (generally the first week of October) marks the end of when you can safely apply growth regulators, which we applied on three separate occasions at 1500 ppm of Cycocel each time. For greater height control, we used 750 ppm Cycocel paired with 2500 ppm B9. This was for our more vigorous varieties. We continued to measure pH, EC, and height on a weekly basis to generate ideas as to why certain crops were growing certain ways, or why they were incurring damages.

IPM became an extremely important aspect of my job when poinsettia season arrived because of the dire need to reduce pests and bacterial damages that the crops are susceptible too. The major problems we experienced were caused by fungus gnats and white flies, although this year we seemed to limit them significantly as we incurred very minimal losses and minimal damages. This year, Roy (the IPM manager) focused on using an abundance of beneficial insects. We released millions of Amblyseius swirskii and Amblydromalus limonicus mites to attack the fungus gnat larvae, as these are the only life stage of the gnat that cause damage. They cause damage by infiltrating the stem of the poinsettia and girdling it below the soil line, creating an incapability for the plant to draw up water and nutrients. You can’t see the damage physically unless you remove the plant from the soil, but you can see symptoms from this girdling as the plant becomes more and more wilted and sad looking even though it is constantly being watered. Many mistake this damage for botrytis damage, but with a quick
peek at the roots or stem you can tell the difference. Botrytis can be seen in the root system as the roots develop a decaying stench and become brown and stringy. We didn’t suffer sufficient botrytis damage this year. The white flies present problems more noticeable in the leaves because they are suckers, and they breed incredibly fast. Fortunately, we did well in keeping the insects below our threshold.

After all of my thoughts have culminated into words on this internship write up, it is evident that this experience has been greatly beneficial to me. I have written this not to boast, but simply to enlighten you all on the impact my internship has made on me. From several previous Vic and Margaret Ball scholarship recipients I had heard that this experience was life changing, and I couldn’t agree more. Overall, I have not only gained the plant knowledge that I desired but have also developed an understanding for the ins and outs of a large-scale flower operation: how to run the business. The management aspect of the industry is what I feel is the overarching goal that the scholarship program seeks to instill in students, molding us into the future business leaders of the floriculture industry. My take home insight will significantly catalyze my desires in this business that otherwise may have been slow to fruit. Again, words cannot express my gratitude for this opportunity, and I thank you guys at the AFE immensely for believing in students such as myself.