DILMUN HILL
MARKET GARDEN REPORT
2013

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**Dilmun Market Garden Managers**

**Alexandra Griffen**  
*Agriculture Education, Natural Resources ‘14*

Alex is from a small town in upstate NY, just outside of Saratoga Springs. Although she grew up on a sod farm and was surrounded by agriculture as a child, she was never very interested in agriculture until she came to Cornell. Starting out as an *Environmental Undecided* major in CALS, Alex has gained an increased interest and appreciation for sustainable agriculture throughout her time at the university. With this growing interest, she seized the opportunity to work as a manager of Dilmun Hill, excited to learn more about the management and production of sustainable vegetable farming through hands-on experience! She is very grateful for her time with Dilmun, and has learned A LOT! Besides farming, Alex also loves to sing, run, and go on adventures!

**Asia Peureux**  
*International Agriculture and Rural Development ‘14.*

Asia grew up in the southern Alps of France, surrounded by agriculture, and yet knowing so little about it! After a few years of wondering what she was going to do with her life, it was in the middle of the African bush that she suddenly discovered a passion for sustainable agriculture and decided that an ag education with a possibility of hands-on experience on campus was meant for her. She transferred to Cornell and almost immediately got involved with the work parties at Dilmun, waiting for her time to finally become a Dilmun manager! She also loves to travel, go into the wild, cook and bake, and takes her commitment to her Ultimate Frisbee team very seriously!
Early season work
The work of the managers starts in the spring when we begin to think about the crops we would like to grow. This year, we ordered seeds online from Johnny’s Selected Seeds and High Mowing Organic Seeds, but also selected from whatever was left over from the previous year. When the seeds arrived in April, we began to plant them in trays at the Gutterman Greenhouse as often as we could. In May, the Tortilla Flat was transformed into a system of permanent raised beds, and by the end of the month we started to plant the first transplants.

The heaviest part of the work in the early season was bed preparation. In order to make sure that the newly constructed permanent raised beds contained enough nutrients to support plant growth, we covered a majority of the beds in compost before transplanting any seedlings. We also placed a layer of straw mulch on some beds in order to suppress weed growth.

After choosing what seeds we wanted to plant for the year, we also had to review and solidify our crop rotation plan. Since the beds in the Tortilla Flat were completely redesigned this year and oriented differently than beds in the past, our crop rotation had to be slightly redesigned as well. We followed the previous crop rotation as closely as possible, trying not to put plant species or families in the same space they had been the year before. Ultimately, we came up with a newly modified system (described later with the Tortilla Flat) that is easy to understand and follows the new no-till design.
Dilmun land layout

The work of the market garden managers is divided into 3 main sections: the Tortilla Flat on top of the hill, the Pioneer Beds behind the barn, and the Best Management Practice (BMP) next to the Growing Mosaic Garden (GMG) in the contaminated land. Each section has its own strengths and weaknesses and is managed differently according to its properties.

BMP beds

The land past the fence at the top of the hill used to be owned by the Cornell Orchards. In the past, it was a common practice to spray orchards with lead arsenic materials as a pesticide. Because of this old practice, these heavy metals have accumulated in the soil over time and made it virtually unusable for consumption agriculture. However, a couple of years ago, a group of students conducted research on this contaminated land that sought to find ways to keep the land productive while generating safe produce. They found that a physical barrier between the contaminated soils along with 2 feet of added compost is sufficient to prevent the lead and arsenic from infiltrating the crops. They also found that those plants whose fruits were either farther from the ground (tomatoes) or more protected (broccoli) were safer to grow in the contaminated soil. The reason for these guidelines is that they found that fruits do not really get contaminated by uptake of the metals through the plants’ root system, but rather by splashing contaminated soil directly on the fruit itself. Therefore, the higher or more protected the fruit of the plant is, and the more it is separated from the native soil, the less likely it is to be contaminated. Thus was born the BMP. After weeding the raised beds that were already present from the previous years, we sheet mulched with cardboard and then added 2 feet of Cornell Compost on top of it. This year, we prepared two beds in which we planted broccoli and tomatoes. As soon as they were into the ground, the young broccoli transplants were covered with remay to prevent flea beetle damage. As a result of both this careful management and their isolation from the other brassicas in the Tortilla Flat, this broccoli grew well and produced nice consistent heads that were a great success at market. We planted the tomato plants a little later in
the season. The plants grew nicely, but we did not trellis these tomatoes (as an experiment and because bringing up the cages was a real pain!) and the fruit barely came out. This was possibly because the branches were too close to the ground and the fruits rotted before reaching maturity.

Sheet mulch and compost for the BMP beds

**Pioneer Beds**
The pioneer beds are only a few years old and bring mixed results. Although they have a great potential for early season planting, the deer have no mercy and will not give young plants a chance to grow if they are not adequately protected. We first planted beets, radishes, parsnips, carrots, and beans in the pioneer beds. We added a thick layer of compost to the beds before seeding, and attempted to shield the seeds with netting directly after they were planted. We used wire hoops to hold up a double layer of plastic netting over the plants and prevent predation, but deer, groundhogs, and other pets still found a way in. After a month or two of frustration, we finally decided to stop struggling with the pioneer beds and focus our energy on the other areas of the farm that were succeeding in order to get the best results. At the end of the season, we took down the wooden sides of the beds with the help of the Horticulture 101 class, waiting to decide what to do next with this space. A project is now in place to install deer fencing around the lower part of the farm and behind the barn where the pioneer beds previously were, hopefully restricting deer predation and creating a more successful area.
Hoop House
A hoop house, or high tunnel, was installed relatively close to the pioneer beds behind Blair Barn in 2012. This hoop house proved to be very useful this season, as it allowed us to get a head start on our spinach and basil when the weather was still a bit cold. The spinach grew very well, and the basil lasted the entire summer! Later in the summer, we tried to plant sweet potatoes in the section where the spinach had originally been. Unfortunately, we did not double check that the doors to the house were locked before leaving, and the sweet potatoes fell victim to the deer. On the bright side, they did leave the basil!

Tortilla Flat
The Tortilla Flat, located on top of the hill, is market garden managers’ main priority. This garden is where the majority of plants that are brought to market are grown, and is also the biggest area under the managers’ domain. This area usually follows a 9-year crop rotation plan. However, as mentioned above, this year was a little different since the beds were redesigned for the new no-till project. As a result, we modified the plan to fit the new 3-block garden design, making sure not to grow crops in the same areas as the previous year so as to avoid diseases and pests. For more information see 2013 No Till Systems TSF Report under Projects on our website.
As part of the new crop rotation plan, we decided to leave one section of the Tortilla Flat in cover crop for the entire season in order to build soil structure and add nutrients in that section. Respecting this decision, Block 1 was planted only with a combination of buckwheat, Sorghum Sudan grass, and tillage radishes throughout the season. We had originally planned to exclusively use Sorghum Sudan grass, but our seed took a while to get in. As a result, we decided to plant buckwheat while waiting for the Sorghum seed so that the land would not lay fallow and be subject to weeds, diseases, and erosion. The buckwheat grew very quickly and easily outcompeted the weeds. However, we had to be sure to take it out before it went to seed so that it did not spread its seeds and become impossible to control. As soon as the plant formed its white flowers and threatened to start spreading seeds in early July, we began to pull out the buckwheat by hand. Although it sounds (and looks) daunting, this task was not too difficult. The buckwheat came out of the ground easily due to its shallow root system and the help of very moist soil from the season’s heavy rains. We tried not to do too much heavy work in ANY part of the market garden when the soil was too wet, however, so as to avoid compaction. This is especially important for the no-till system, as the soil will not be broken up each year, so any compaction is long lasting. All of the pulled buckwheat plants were left on top of the soil to decompose and serve as nutritious residue.

After the buckwheat had run its course as a cover crop and the Sorghum Sudan seed that we had been waiting for arrived, we began to seed the Sorghum Sudan grass. Unfortunately, this seed, provided to us by our advisor and Cornell Organic Farm Coordinator Betsy Leonard, ran out quickly and left only a portion of the first block of the Tortilla Flat seeded in cover crop. In order to remedy this situation, Betsy then delivered what we thought to be more Sorghum Sudan seeds, but ended up being tillage radishes instead! We only realized that the radishes were not Sorghum Sudan when they began to sprout and grow, and they looked distinctly different from the already-existing Sorghum Sudan grass. Despite our initial confusion, this mix-up turned out to be
beneficial, as tillage radishes help to keep the soil loose and avoid compaction due to their large roots. These tillage radishes may be a cover crop that future managers look into in the future if they are faced with heavy compaction problems.

Block 2 of the Tortilla Flat was largely dominated by cucurbits, but also included plants from the Allium, Fabaceae, and Solanaceae families; as well as beets and carrots that were planted in late August. Here is a comprehensive list of all crops grown in Block 2, running from the top to the bottom of the hill:

- **Alliums**
  - scallions
  - onions
  - leeks
- **Cucurbits**
  - cucumbers
  - zucchini
  - honey nut butternut squash
  - acorn squash
  - delicata squash
  - pumpkins
  - cantaloupes
  - watermelon
- **Beets, Carrots**
- **Fabaceae**
  - snap beans (green, yellow, and purple)
  - dry beans
  - snow peas
  - sugar snap peas
- **Solanaceae**
  - potatoes
  - sweet potatoes

Block 3 of the Tortilla Flat held all other market vegetables except those grown in the high tunnel. These are listed below in order from top of the hill to the bottom:

- **Sunflowers**
- **Lettuce/greens**
  - radicchio
  - winter density
  - spinach
- Maize- both sweet corn and popcorn
- Celery
- Brassicas
  - brussel sprouts
  - cabbage
  - kale
  - broccoli
  - cauliflower
- Solanaceae
  - Peppers- both sweet and hot
  - eggplants
  - tomatoes

Between each block in the Tortilla Flat, we decided to lay down sod in order to decrease erosion, suppress weed growth, and create aesthetically pleasing yet completely durable walkways. The sod was generously donated to Dilmun by the Saratoga Sod Farm, which is owned by Cornell alumni Steve and Laurie Griffen, parents of manager Alex Griffen. The sod required intensive watering during the first few weeks, but we were lucky to have a lot of rain that did the work and saved the water for us. After a couple of weeks, the roots were well developed and we had a beautiful green color between the blocks. The sod requires occasional mowing with a push mower, but otherwise needs little maintenance and is extremely durable to intense foot and wheelbarrow traffic.

Alex laying down the sod
Irrigation
The portion of the farm that resides on the hill is irrigated by water from the Cornell Orchards. There is a mainline pipe that starts in the southeast corner of the farm, right at the border with the Orchards, and runs underground to the bottom of the hill by the fruit swales. The main on-off switch is at this southeast corner, but there are also several valves along the length of the mainline that are used to water the plants. The valve near the BMP is used to fill up buckets with which we water the plants in the BMP. At the valve that comes out near the Tortilla Flat, an irrigation system using a series of drip tapes is attached to the valve in order to supply water to the entire garden without having to hand water the plants. The drip tapes are set up off a mainline that is connected to the water valve, and each raised bed gets its own drip tape with its own knob to control the amount of water that flows through the line. This system saves a lot of water on the farm because it allows water to be applied more directly to the roots of the crops instead of spraying it from above and allowing it to evaporate.

The water for the lower portion of the farm is supplied by a well behind Blair Barn. This well is powered by an electric pump, and must be turned on by flipping switches 17 and 18 in the breaker box in the side room of the barn basement before use. The well could be used to either fill up buckets to water the plants in the pioneer beds and hoop house, or connect a hose to run to those locations. The water from the well was fine until much later in the season when it suddenly became very soapy. This was unexpected, and the cause of the sudden soapiness is still unknown.

Nutrient management
At Dilmun Hill, we do our best to incorporate natural ecological principles into our management strategies in order to create the most sustainable farm possible. This effort is best exemplified by our two permaculture gardens; the GMG and new permaculture garden. We also use ecological principles in the management of the Tortilla Flat, BMP, and Pioneer Beds. The best example is the newly designed market garden at the Tortilla Flat. The new permanent raised beds in this area are part of a no-till project in which the soil will not be cultivated each year, but will instead retain the nutrients and natural residues that are added to it and improve soil structure from year to year. These beds are also contoured to the shape of the slope in order to increase water catchment and stop nutrients from escaping the soil in runoff. To learn more about the no-till project and contoured beds, please read 2013 No Till Systems TSF Report under Projects on our website.

The main way in which we add nutrients to our soil is by compost brought to us by the Cornell Composting Facility. This is a more sustainable alternative to synthetic fertilizers, as it returns the nutrients that were once taken from the ground back to the ground in one big positive feedback loop. The compost is also a great source of nitrogen for the crops, as it contains a generous amount of decomposed manure and food scraps.
As an extra source of nitrogen for those plants that need it, we also use an organic fish emulsion fertilizer spray made of liquefied fish bones, blood, and other organs. We use this specific fertilizer over others because it follows our desire to follow organic practices and is highly nutritious to our plants. It is applied to plants by using a backpack sprayer, where the spray nozzle is hand-held and the fertilizer is sprayed directly on each plant that needs it instead of across a variety of plants for which it is unnecessary.

**Partnership with the Orchards**

This year, Dilmun continued its partnership with Cornell Orchards in which we helped them sell their fruit at our market, and then retained half of the profit. Each week, we would spend about 3 hours picking blueberries, and then bring them to our market on the Ag Quad to sell. We would occasionally pick tart cherries and plums for our market as well. After picking blueberries each week, we would stop in to the Orchards barn and see if they had any other fruit they wanted us to take to market. Throughout the summer, we also sold doughnut peaches, pears, and blackberries. This partnership was extremely beneficial for Dilmun, as the fruit attracted many customers and sold out every week! It is also good to pick the fruit that would otherwise be wasted, as the Orchards do not have staff picking all of their fruit routinely. Our partnership with Cornell Orchards ended this summer when the blueberries became infested with Spotted Wing Drosophila, a fly that lays and hatches its eggs inside blueberry fruits. It was also toward the end of the summer and the Orchards began to sell their own products. In order to continue this mutually beneficial relationship in the future, contact Eric Shatt at Cornell Orchards. This is strongly encouraged!
Peaches and blueberries from the Cornell Orchards

Selling the produce

Preparing the produce
Each week before market, we would need to harvest and prepare vegetables to be sold. This process included picking the vegetables, rinsing them, and organizing them into crates. The crates were then put on a bike cart and we would bike to market with the produce in tow. Earlier in the season when there was not too much to bring to market, we would harvest our vegetables a few hours before and be ready to go. Later into the season when the produce was plentiful and our time was limited, we would start harvesting for market the day before in order to be sure that everything was ready. Early harvesting required more preparation: we would crate the vegetables as usual, but also wrap the more vulnerable leafy greens in wet paper towels and place all produce in the refrigerator at the farm in order to keep everything fresh. We would often utilize the help of our volunteers at work parties to harvest for market.
Markets
Weekly markets were held every Thursday from 3-6pm on the Ag Quad on campus. We were normally stationed at a table just outside of Mann Library, but would set up inside the lobby of Mann in the case of rainy weather. It is always good practice to keep an eye on the weekly weather forecast so that if the weather is supposed to be bad, you can book the lobby in advance. Setting up for market each week included retrieving tables, tablecloths, a trifold with information about Dilmun, a chalkboard to write prices on, and a lock box for money from Betsy’s office in the Plant Science building. After setting up the tables and such, we would bring in the produce and set it up on the tables. Markets are a great chance for publicity, attracting new volunteers, and sharing more information about the farm. With this in mind, we would always try to be organized for market and make the table look aesthetically pleasing for customers. Often times, this included picking wildflowers from the fields at Dilmun and putting them in vases to spruce up the tables. This worked wonderfully, and a couple of bouquets were actually sold to customers!
Summer markets were rather quiet, and their success rate varied week to week. In the fall semester, however, we were kept busy! We began to sell at the Cornell Farmer’s Market, which was also located on the Ag Quad. The Cornell Farmer’s Market ran every Thursday from 11am-3pm, and the responsibility of setting up, running the table at market, and breaking down was split up between managers and volunteers. This market was a wonderful opportunity to sell produce to fellow students, talk to new and returning students about Dilmun Hill and what it’s all about, and recruit new volunteers for the farm.
Manndibles
In previous years, Dilmun has maintained a relationship with Kathleen Pasetty and Manndibles Café in Mann Library for wholesale vegetable sales. At the beginning of the summer, the managers met with Kathleen to re-establish this relationship and express our interest in doing business with Manndibles again. We determined which vegetables they would be most interested in throughout the summer, and exchanged contact information so that their kitchen staff could contact us on a week-by-week basis for what they needed. Their orders would often consist of dicing tomatoes, swiss chard, and kale, with occasional orders of zucchini, cucumbers, and celery.

Other sales
Besides selling vegetables at market and with Manndibles Café, there were some occasions where people would make special orders and come to the farm to pick them up. For example, when there was a huge excess of celery, we had a woman who worked at Gannett Health Services order 50lbs of celery to use in soup stock that she canned with her family.

Roadside stand
After using the roadside stand for one afternoon and actually losing profit (someone stole the money that we left as change), we decided that it was not an efficient mode of marketing. In addition to the fact that we could not be there to monitor sales, it was also frustrating because we couldn’t share information about the farm to whoever stopped by. The stand also seems to be a little too tucked back to really attract anyone into the farm to buy produce. Despite our negative experience with the roadside stand this year, there is definitely potential to use it; possibly with more careful planning and organization.

Loaves and Fishes
Whatever produce we did not sell, give away at work parties, or eat ourselves, we donated to the Loaves and Fishes soup kitchen in downtown Ithaca. They were always very appreciative of our donations, and it was a great way to use our vegetables instead of keeping them for the next market or work party and letting them get old and inedible.

Volunteers and Work parties
Volunteers are an integral part of Dilmun. They help run markets, harvest vegetables, lead outreach activities, and get large or daunting chores done that the managers would not be able to accomplish by themselves. In the summer, we held work parties, or volunteer hours, every Wednesday from 5-7pm and Sunday from 2-5pm. During the fall semester we kept these same days, but moved the Wednesday time to 4-6pm in order to adjust to our volunteer’s semester schedules, as well as the changing day lengths. We had a total of about 500 volunteers come for work parties over the entire season, although the work parties were variable in the amount of
people that would come each week, and we could have anywhere from 2 to 30 people show up to help. Because of this, it was important to always be prepared with multiple tasks for any group size before the work party began. The activities and projects that were accomplished during work parties included trellising tomatoes, harvesting for market, composting beds, wood chipping pathways between raised beds, and weeding. At the end of each work party, we would set out vegetables for volunteers to take home with them as a “thank you” for their donated time.

Volunteers weeding in the Market Garden

Farm Tours, Hosted groups, and Outreach
One of the main components of Dilmun Hill Student-run Organic Farm is outreach and education. As managers, we learn more about organic and sustainable vegetable farming every day on the job! One of the most exciting parts about being a manager is being able to share that new knowledge with other students, peers, and professors from the Cornell and greater Ithaca community. This summer, we hosted many groups. Once a week throughout the summer, we would have two groups of campers ages 9-13 from a Cornell Outdoor Education (COE) program come to the farm and participate in activities pertaining to the farm, or work party chores. Some of the activities that we did with the COE groups included a blind taste test of different fruits and vegetables found on the farm, a scavenger hunt around Dilmun, a tour of the farm, and harvesting vegetables. We also had one group of International Agricultural Librarians come to the farm over the summer. They were a complete joy to have, as they shared ideas from their different countries with us, and we were able to share new ideas and practices with them that they can put into use at their homes.
The majority of the groups that Dilmun hosted this year came in the fall semester. We had several Cornell classes utilize the farm’s resources through tours, labs, and work parties. Some classes came to the farm to take a tour, and some made work parties a mandatory part of their class. Some of the classes that came to Dilmun this fall include HORT 101: The Art of Horticulture, CSS 1900: Sustainable Agriculture, CSS 2600: Soil Science, the Small Farm Dream, and Introduction to Permaculture. In addition to classes from Cornell, we also had a class from the New Roots Charter School in Ithaca come to the farm a couple different times as a part of their research on nutrient management. The students took notes and asked many questions about how we manage nutrients at Dilmun, and were able to later come back to the farm and help work in the Market Garden.

Another form of outreach that we had this year was hosting booths at several events on campus. For example, we had a table at Club Fest in the beginning of the fall semester that really got our name out there and gained us more interest and volunteers from the Cornell student body. We also held a booth at Homecoming where we sold vegetables and had free pumpkin painting for families with small children and college students alike. Outreach like this is a great way to share what Dilmun Hill has to offer with the community at large.

Events
Aside from the market, work parties and tours, other social events at Dilmun included movie nights and potlucks. These events are a great way to connect with volunteers or other people interested in Dilmun with food and activities that everyone enjoys. We also held a Field Day that was open to the public and included many activities from inoculating logs and making T-shirts, to taking detailed tours of the farm and picking apples. This event is meant for those individuals that are not as familiar with Dilmun to get a taste of what we do and what we are all about. Towards the end of the fall semester, we also had a Hoedown event at which there was live music, dancing, food, and great people with which to celebrate a great season!
Crops in Review  
Brassicaceae  
The Brassica family is very important at Dilmun, as they are in high demand at market. Even with their desirability, however, they do not come without their challenges. The Brassica family is especially susceptible to a certain pest called the flea beetle (Phyllotreta cruciferae). This insect, though small, causes a LOT of damage if preventative measures are not taken right away. It will start as just one or two small black dots on a plant, and before you know it (within hours), the plant is covered with black dots, which are the flea beetles! The flea beetles damage the crops by eating the leaves and causing them to become extremely holey and cosmetically undesirable. Although they do not cause any sort of fungus or cause the taste to be any different, crops with flea beetle damage cannot be sold at market. Since we do not use pesticides at Dilmun, the only way to really deal with flea beetles is by covering the crops with remay immediately after they are transplanted. This is especially important because the flea beetles target the plants when they are young. If the crops are covered for long enough to let them mature and get established, they can be then be uncovered without any serious damage. Once flea beetles infect a plant, however, they should NOT be covered with remay, as the material will just trap the insects on the plants and possibly cause even more damage.

Kale: This summer, we planted the varieties of Toscano, Redbor, and Winterbor at the end of May and into early June. Our kale was hit the hardest with flea beetle damage, as we forgot to cover it after we planted it, and left it uncovered over night. The next day we came to the farm to see all the kale leaves covered in black dots (flea beetles), and we had to just let the pests run...
their course. We would go to the plants and try to shake the beetles off, but they would just go right back to the plant. After about a month, however, our kale recovered and turned into a beautiful, non-holey crop that sold wonderfully at market and to Manndibles Café, and was a great crop to give away to volunteers. It is definitely recommended to keep planting kale in the future, as it sells very well, and is just plain tasty! The curly varieties tend to do better than the Toscano kale.

**Broccoli:** We only planted the Belstar variety of broccoli this year. Since this crop was planted around the same time as the kale, and we had not yet learned our lesson, we did not cover the plants in the market garden with remay to protect from flea beetles, and soon regretted it! The plants eventually overcame the flea beetle damage and seemed to be doing fine, but the heads never formed correctly and seemed to go to seed long before their time. However, the broccoli plants in the BMP were covered immediately after being planted and because of this, and the fact that they were removed from the flea beetle pressure in the market garden; they did really well and formed magnificent heads. It is definitely recommended to grow lots of broccoli! Even though we had a pretty good amount, we definitely could have seeded more.

**Cauliflower:** This year, we planted Goodman, Skywalker, and Snowball varieties of cauliflower. While a few heads came out beautifully, the majority were like those of the broccoli and some seemed to flower prematurely, leaving a yellowish and bitter-tasting heads that was unsellable. We are not entirely sure why this happened and what caused the unusual taste, but it could have been a result of flea beetle damage, or perhaps heat damage. The cauliflower did not sell very well at market, but is definitely worth planting again, as it has great potential. It would certainly be a good idea to monitor it closely, however, to make sure it is forming heads and has a proper taste.

**Radishes:** We decided to plant the radishes in the pioneer beds this season, and they did not survive the deer pressure. As soon as they began to sprout, they were picked clean. We tried to find a place for them in the market garden, but the space was too limited and we decided that there was not a large enough demand for them to worry about them any further. Perhaps the former pioneer bed area will be a good place for them in the future, however, as it will soon be enclosed with deer fencing!

**Kohlrabi:** The kohlrabi, though planted earlier in the season, unfortunately suffered the same fate as the radishes in the pioneer beds. No matter how hard we tried, we just could not compete with the deer!

**Cabbage:** The cabbage plants were planted much later in the season than the majority of our crops, toward the middle of July. By this time in the season, we had finally gotten smart and covered this brassica with remay immediately following planting. Because of this good
management practice, the cabbage plants grew quickly to a nice healthy size and shape, and sold well at market. Unfortunately, an early frost damaged this crop before we were able to sell the majority of them, causing them to become less cosmetically appealing. We were still able to give them away to volunteers.

**Brussel Sprouts:** The brussel sprouts had a timeline similar to that of the cabbage; it was planted later in the season, covered immediately with remay, and unfortunately hit by frost. The brussel sprouts, though properly cared for and not hit with heavy flea beetle damage, also formed somewhat irregular heads and were a little difficult to sell. This irregular formation could have to do with our lack of knowledge about the plant, or some impact of the weather or environmental factors.

**Cucurbitaceae**

This family is a bestseller at market, and great for giving away to volunteers. This summer, cucurbits took up the majority of the market garden, and did beautifully. The cucurbits are subject to two nasty pests called the striped cucumber beetle (*Acalymma vittatum*) and the squash bug (*Anasa tristis*). The cucumber beetle arrived first to Dilmun this summer, populating the flowers of cucumber and zucchini plants by the hundreds. A little later in the season, the squash beetles began to show up, crowding the underside of squash leaves in swarms. These pests did not show any noticeable damage at the very beginning, but soon began to make the plants rot and die by taking their nutrients. In order to combat these pests, we were very faithful about going around to all infected cucurbits each morning and manually squishing any cucumber beetles or squash bugs we could find. This actually helped the plants a surprising amount, and they lasted longer than they would have without our diligence. In the future, however, it would probably be a good idea to take the same approach with cucurbits as with brassicas, and cover the crops with remay directly after planting them. This could help their season last a little bit longer. Cucurbits are also susceptible to a disease called powdery mildew (*Podosphaera xanthii*), which causes damage to the leaves, and later the fruits, of the crop and appears as white powdery-looking substance on the plant. We did not see much of this disease in our plants this year, which could have been a result of their crop rotation, the new permanent raised beds, different management practices, or environmental factors. However, even though it was not a problem this year does not mean that it should be taken lightly, and preventative measures should be looked into for the future.

**Cucumbers:** This summer, we grew the Little Leaf and Marketmore varieties of cucumbers, and they did well. The cucumbers grew very fast in the beginning, but started to slow down as the season progressed. This could have been a result of cucumber and squash beetle pressure and damage, or other environmental factors. Cucumbers sell very well at market and are a favorite of many.
**Summer Squash:** We grew an array of summer squash varieties this summer, including Cha Ching Zucchini, Dark Green Zucchini, and Dunja Zucchini, all of which were very productive and sold well at market and to Mannibles Café. At one point in the season, we had so much zucchini that we didn’t know what to do with it! We ended up donating a lot to the Loaves and Fishes soup kitchen, and selling a good amount in bulk to Mannibles. It is important to keep an eye on zucchinis as they grow because if they are not harvested at the right time, they will grow enormous, and will lose flavor and not sell as well at market. This crop also suffered from cucumber beetle and squash bug damage, causing it to die a bit prematurely. As mentioned before, it is recommended to cover this crop with remay to extend its season and prevent damage.

**Winter Squash:** For our winter squash selection, we had Honey Nut Butternut, Acorn, Delicata, Baby Pam pumpkins, and Jack Be Little Pumpkins. Although we accidentally planted this crop too early in the season (early July instead of late August), they still did very well and were enjoyed by volunteers, managers, and customers alike. They too suffered from squash bug damage, and so ended their season a little prematurely. This crop was *not*, however, very affected by cucumber beetles. In the future, it would definitely be beneficial to plant winter squash at the correct time in the late summer/early fall, just so that it is available when it is at highest demand at market.

**Melon:** Only one variety of melon was grown at the farm this year, and that was PMR Delicious 51. Although there weren’t many, these melons were a farm favorite and grew to be a delicious sweet and juicy treat. We were only able to sell one or two at market, but they were highly enjoyed by managers and volunteers at the farm. The melons did not seem to suffer from any sort of damage, although they did seem to have a delayed growth, for which the cause is unknown.

**Amaranthaceae**

This year’s amaranths did very well and did not have any real pest or disease damage.

**Beets:** This year’s varieties included Bull’s Blood, Touchstone Gold, and Chioggia Guardsmark. These beets were originally planted in the pioneer beds, but picked off by the deer at the first sign of growth, as with the radishes and kohlrabi. Beets, however, were in slightly higher demand than the former two pioneer bed plants, and so were given a second chance in the market garden toward the end of August. These second rounds of beets did much better, but did not produce a huge amount of mature plants, and were therefore never sold at market. In the future, beets should be planted earlier in the season, and can probably be planted in the former pioneer bed area that will be newly fenced in.

**Swiss Chard:** We only grew the Improved Rainbow Mix variety and it was very successful! This crop did very well and sold very well at market and was in high demand from Mannibles Café. Its beautiful multicolored stems also made our table at market look very attractive!
Spinach: This year we only planted the Bloomsdale variety of spinach, but it also did very well. We planted it in the hoop house very early in the season (early May), and were able to harvest it until about mid-June. It sold well at market and was loved by volunteers. Since spinach is more of a cold weather crop, it would be a good idea to plant even more of it at both ends of the season (early May and late October/November) in order to continuously have something to sell.

Fabaceae
Only a couple of different plants within the Fabaceae family were grown at Dilmun this year, but they did very well and had a long and productive season.

Snap Beans: This year we had green, yellow, and purple snap beans that gave some beautiful color to our garden, market stand, and diets! The snap beans were not subject to any pests or diseases, and lived a long and productive life.

Dry Beans: We grew a variety of dry beans a little later in the summer that did very well. However, we were not extremely familiar with this plant, and so did not harvest them appropriately and probably did not have as good of a harvest as we could have.

Peas: We had a small section of sugar snap peas as well shelling peas that grew fairly slowly and did not produce a lot for harvest. These plants were saved for snacking and to give to volunteers, as they did not produce nearly enough to bring to market.

Alliaceae
Onions: We grew Cortland, Redwing, and Texas Golden varieties of onions this year. All varieties were extremely productive and grew to be huge and beautiful in color. Despite their inherent beauty, they did not sell too well at market. However, it is definitely recommended that they be grown again, as both volunteers and managers loved them!

Leeks: We had only the Tadorna variety this season, and it did very well. Leeks sold surprising well at market and did not have any disease or pest problems throughout the season.

Scallions: This year we just grew the White spear variety, and they were a great early season crop. They sold wonderfully at market and were great to have for our volunteers early in the season when not much else was available. It is highly recommended to use them again.

Solanaceae
Heirloom Tomatoes: We had an assortment of heirloom varieties this year, including Black Trifele, Copia, Green Zebra, Brandywine, Cherokee Purple, and Indigo Rose. Their diversity and unusual colors and shapes impressed people at market and on farm tours, and they were a big hit.
Although they are more susceptible to disease because of their ancient genetics, the heirloom varieties have a richer taste than other varieties which make them more desirable for some.

**Hybrid Tomatoes:** We had Early Girl and Amish Paste varieties this summer. These varieties created nice uniform and firm tomatoes that were good for selling to Mandibles or people not ready to experiment with unknown heirloom varieties. They are especially good for dicing or slicing.

**Cherry Tomatoes:** This summer we chose Black Cherry, Golden Nugget, and Peacevine Cherry varieties. All of these varieties did fine throughout the season, but were hit by late blight later in the season and began to wilt and die. It would definitely be a good idea to look into early and late blight prevention strategies for future seasons. The Golden Nugget variety was also a little disappointing because their taste was rather bland and watery despite their vibrant color.

**Tomatillos:** We had a small area of tomatillos that did not really produce anything sellable, but they also did not have or create any problems.

**Eggplant:** We had Black Beauty and Listada de Ghandia varieties of eggplant this summer, neither of which produced anything that we could sell. Their lack of productivity was not because of the varieties, but rather because of unsuspected flea beetle damage that completely stunted the crops, and they were unable to recover. Whatever fruits did develop were small and rotted before we were able to harvest them. In the future, it is highly recommended to cover the eggplants with remay directly after planting.

**Sweet Peppers:** The varieties of sweet peppers that we chose this summer included King Crimson, King of the North, and Corno di Toro. Like the eggplants, the sweet peppers had a tough time getting to maturity. We did not notice any flea beetle damage on the peppers, but it is possible that they could have benefited from being covered with remay directly after planting. Despite the delay, we did eventually get a couple of mature sweet peppers that we were able to sell at market and give to volunteers. Many of the peppers would begin to rot before fully maturing, however, and the reason for this is unknown.

**Hot Peppers:** We grew both Hungarian wax and Jalapeno varieties of hot peppers this summer, both of which had a slow start but were eventually plentiful toward the end of the growing season. We do not know what the cause of the stunted/delayed growth was, but it is recommended to keep an eye out for pests and take preventative measures in the future. Although we did not do it this summer and still got a good harvest, hot peppers would also benefit from having the soil covered in black plastic before they are planted so that the soil is extra warm and promotes their growth. Perhaps if we had done this, they would have grown sooner.
Potatoes: We did not plant the potatoes until much later in the season, but they grew well and were great to give to volunteers. Our volunteers also loved harvesting the potatoes, and they could be a great plant to harvest for groups of younger kids that come to the farm.

Sweet potatoes: Our sweet potatoes this year came from cuttings that were sent to us from Geneva, NY. We covered the soil in black plastic, found a YouTube video on how to plant the cuttings (since none of us had previous experience with sweet potatoes before), and that was it! The vines grew well and were really promising until we tried to dig them out and only got a few. Sweet potatoes are a crop desired by many customers, and definitely worth trying again. It would certainly be a good idea to do more research on this crop before planting.

Miscellaneaseae

Apiaceae

Carrots: The early planting of carrots in the pioneer beds were eaten by deer and did not yield any mature plants, but we got more seeds in the end of the summer that we planted in the market garden. These seeds gave rise to a few tasty oddly shaped carrots that tasted good, but we were not able to sell any at market. Carrots will hopefully be able to be planted in the former pioneer bed area that will be fenced in in the future.

Celery: We grew the Tango variety of celery this year, and it was incredibly successful! We had so much of it that we ended up giving a lot to Loaves and Fishes, as well as doing a large order sale with one customer. The celery had a nice long, productive season with no real pest or disease damage.

Corn: This summer, we decided to grow Sweet corn and black popcorn. The sweet corn was very successful and should definitely be grown in greater quantities in the future, as it was in high demand at market. The black popcorn could have been successful, but we were not really sure what to do with it or how to eat it once it was harvested. If black popcorn is grown again, more research should be done to understand how to use it.

Asteraceae

Lettuce: We grew Winter Density, Red Butterhead, and Radicchio varieties this year, all of which did pretty well. We had two planting sessions of lettuce. The first was with the winter density and the radicchio, and the second was with the Butterhead. The radicchio takes about three months to form a fully mature head, but the other varieties grew very fast. In the future, it would be extremely beneficial to come up with a successive planting schedule for the lettuce, as it grows quickly and is always in demand. We were not very good with that this season, and stopped growing lettuce long before we should have. We also made the mistake of trying to keep the lettuce in the ground too long, and a lot of it ended up bolting and becoming inedible. Even if
market is not for a few days, mature lettuce heads should be harvested right away while it is still edible.

**Sunflowers:** We did not use our sunflowers to harvest seeds, but more as a decorative crop to make the garden look even prettier. However, seeds could definitely be harvested and either sold or given to volunteers as snacks in the future.

**Perennial Crops**
On the lower part of the hill, just below the Tortilla Flat, there are a variety of perennial crops planted in swales that help with water catchment on the hill. These plants are generally not sold at market, but they should be taken more advantage of, as they are quality plants and quite intriguing! We do not give any extensive care to these crops, except for occasional weeding and straw mulching. They are cared for under a more “laissez faire” strategy.

**Paw-Paws:** This is a tropical-tasting tree fruit native to the northeast, but a relative of bananas and mangos. It has the outward appearance of a pear, but a custardy inside that tastes like a combination of bananas and mangos. The fruit is very delicate and hard to transport, but a great snack at the farm! They did not fully ripen until October this year, and the wait was agonizing!

**Blueberries:** Our blueberries are located on the left side of the swales directly below the Tortilla Flat. They are not extremely productive, but a great attraction and snack for groups that come to the farm. These blueberries are far less fat and juicy than those at Cornell Orchards, and this difference is due to both management practices and difference in variety.

**Strawberries:** We have a small patch of everbearing horticultural varieties of strawberries in the swales heading up to the Market Garden. These varieties are very small and rather tart, but are nevertheless a tasty treat and bear fruit all season. There are also an alpine variety of strawberries located in the GMG that produce bigger and sweeter fruits than the horticultural varieties.

**Asparagus:** There were a few asparagus plants scattered in the old Market Garden and by the pioneer beds, but nothing extensive or productive. It might be beneficial to look into growing asparagus again in the future, but they were not in demand and we did not suffer from not having them.

**Recommendations**
This summer was full of learning experiences for the Market Garden Managers at Dilmun Hill. Since we were both still learning, many mistakes were made, and many lessons were learned:

- **Avoid the Market Garden/Tortilla Flat when wet.** This is a major thing to keep in mind, especially with the implementation of the new no-till permanent raised beds. Since the beds will not be agitated each year before planting as they have been in the past, any
compaction that is done to the soil stays there. Constant compaction will lead to a soil in which the roots have no place to go, and plant productivity could greatly decrease.

- **Cover brassicas, cucurbits, and eggplants with remay IMMEDIATELY after planting.** This will greatly reduce the amount of damage caused by flea beetles and cucumber beetles, and save you a lot of sadness.

- **Spray fish emulsion regularly.** Although we had a very wet season and used a generous amount of compost on beds before and after planting, our crops could have used a little extra TLC and nitrogen! Of course, be careful not to overdo it either, as you do not want to cause nitrification.

- **Keep a well-organized journal, notebook, or digital record of ALL decisions made, events that have happened, work party attendance, etc.** This will come in especially handy later on in the season when you look back to remember when you planted a certain crop, why you decided to order a certain seed, etc.

- **Improve roadside stand.** Although it did not work out for us, the roadside stand has serious potential. With more planning and organization, it could be a very good source of profit.

- **Stay organized and have a plan for planting schedules.** We would often have transplants from the greenhouse that we did not know where to put, so they would sit outside for far too long and sometimes go to waste! We were also not very good at succession planting, which meant that we did not plan ahead to seed more of a crop that had a short life cycle, so once we were out, we had nothing else to give (especially with lettuce). Having a predetermined planting schedule or at least a secure idea of where you want to put every plant that you seed and when you want to plant it is very important.
Infrastructure additions

Greenhouse:

Greenhouse construction was completed this spring (’13). The plans are in the drive under hoop house instructions. The plastic must be removed every winter because it cannot handle the snow load.
Original placement was at point 1; however we are hoping to move it to location two for access to water from the water tower.

*Why have a greenhouse?*
A greenhouse will enable us to extend the season on either side of the growing season, grow a wider variety of crops, and start more crops on premise rather than outsourcing to Guterman Greenhouses.

**Water Tower:**

*Why?*
This water tower will capture runoff from the roof and keep it high in order to provide pressure for the greenhouse and for the king stropharia inoculation bed. The quality of the water will determine its use. We will be working with Elizabeth Bihn, Senior Extension Associate in the Department of Food Science at Cornell University. She is currently the director of the Produce Safety Alliance and program coordinator for the National Good Agricultural Practices (GAPs) Program.

The water tower was constructed from four 22’ long cedar posts that are buried 4’ into the ground, back-filled with barbed-wire-reinforced concrete. All the additional wood is scrap black locust bought from Locust Lumber in Newfield and secured to the vertical posts with ⅜” and ½” lags. A detailed as built Cad drawing is in the drive.
Deer Fence Expansion:

The new addition of the deer fence will bring our garden plot much closer to the barn and put it in the middle of far superior soil. The expansion will be completed spring 2014.