Dilmun Hill Farm
Report 2012
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Meet the Managers

Emily Burrichter

I grew up in the suburbs of Philadelphia without any agricultural background or knowledge. In high school, I was first introduced to farming through Sprout Creek Farm in Poughkeepsie, NY. It is an educational dairy farm dedicated to broadening agricultural awareness and introducing young people to farming. Since then, I’ve also worked two seasons on a small vegetable CSA in Pennsylvania, as well as a small livestock farm. I feel lucky to have access to a place like Dilmun where I can gain more vegetable growing experience while continuing my agriculture education at Cornell. I had heard about Dilmun Hill before I even arrived at Cornell, so I was immediately involved in the work parties and free veggies. Since then I’ve been welcomed onto the steering committee, which was a great way to become more involved with the inner workings of the farm. As a market garden manager, I was thrilled to be able to experiment with growing vegetables and spend more time at the farm.

Ethan Keller

I come from a small suburb outside of Boston. I have worked on farms since I was twelve, serving as everything from the cashier to the tractor driver. I am currently studying Environmental Engineering at Cornell, and I have plans to implement sustainable solutions that reduce agricultural waste and human waste overall. My favorite moment on the farm was our showing of Fantastic Mr. Fox on the outdoor projector screen. The night had a few clouds that casually passed in front of the full moon, and below the field was full of fireflies that danced with Wes Anderson’s whimsical foxes. Seventy people crowded the small field, surrounded by homemade Tiki-Torches constructed out of beer bottles. The refreshment table was quickly emptied, but at the beginning stood proudly bearing homemade chips, parsley hummus, kombucha, Kefir, bread and more.
Alessia McCobb
I grew up in Ithaca, with a nature-loving parent and a delicious-food-cooking parent, and thus came to love food and its connection with the earth. I have become more interested in agriculture since arriving at Cornell, and spent part of my summer after freshman year volunteering at Crystal Spring Farm, an organic CSA farm in Brunswick, Maine. I also love hiking, marveling at mushrooms, doing crafts, and laughing at my own corny jokes I first began volunteering at Dilmun work parties during my freshman year here at Cornell. I immediately enjoyed the "parties"—they are such a great way to escape the library and spend time with other goofy people. It’s also amazing how much you can learn every day at Dilmun.

The five Dilmun Managers at the Campus Farmers market, Fall 2012
Tillage and Cover Cropping at Dilmun Hill

Soil compaction is one of the greatest difficulties we have at Dilmun. Our heavy clay soils are potentially very fertile; however they are very unforgiving when you run heavy machinery over them. Years of moldboard plowing have broken up our soil aggregates and left us with dense compacted soils. We started a number of procedures to help improve the soils, but caring for soils is a lifelong process. It is our hope that what we have started will be continued and improved upon for years to come.

Our tillage system at Dilmun has recently evolved through the acquisition of our rotary plow implement for our BCS walk-behind tractor. In previous years, tillage was done by Campus Area Farms’ tractors with a moldboard plow. With the rotary plow, we could do our tillage whenever we wanted. This type of flexibility has given us the ability to be much more precise with our plantings and to be more proactive about improving and protecting our soil.

The past few seasons, the managers have taken advantage of this handy machine, however, Dilmun has plans to move towards no tillage. The BCS acted as a nice transition from annual moldboard plowing to no till permanent raised beds, but even the much smaller and less invasive rotary plow has its downsides. The plowing breaks up aggregates, burns up organic matter, disturbs the microorganisms and is generally unsustainable in our case. It also leaves the soil especially vulnerable to compaction and erosion. A complete look at our future plans for the market garden can be found at the end of the report in the “projects” section.
**Raised Beds**

Raised beds are an important part of the system and offer a number of advantages: they drain faster, they reduce compaction on the bed surface, they are more ergonomic to work on, they make it easier to lay down plastic mulch, and they provide a means to incorporate compost and other soil amendments. They also help fight compaction by concentrating foot traffic to the furrows and by providing a deep space for plant roots to penetrate. In addition, if these beds are maintained permanently, heavy tractors and equipment will no longer have to come onto the field.

![Raised Beds Image]

**Cover Cropping**

The Cover Cropping regime we adopted can be split into two parts, our main summer Cover Crop (Sorghum-Sudangrass), and our fall and spring covers (oats and peas, rye and vetch, and rye). Betsy Leonard (Organic Coordinator) is usually able to get us extra seed from cover cropping trials from years past. The Tortilla Flat is not that big and will end up being seeded with cover in small patches at a time, so any small left over bit of seed can be put to use. There are many resources about cover cropping available here at Cornell and through extension. Be sure to read up on the different options and their management strategies.
In October after we had the Tortilla Flat chisel plowed, we seeded rye as a cover crop. Much of it germinated over the fall, and then went dormant over winter. Their living roots will trap nutrients in the soil over the winter and prevent leaching. As well, they will start growing early in the spring and provide weed suppressing cover just as the weather warms up. Rye can be killed by mowing it once the flower head as formed. You want to prevent the rye from setting seed, otherwise they will become weeds in the field. In areas with rye that are not on raised beds, the rye can be managed by mowing, and then plowing it under. The rotary plow will easily incorporate residue from oats, peas, rye, or vetch into the soil.

Buckwheat is a nice cover crop that we are considering for use early next season. After the tortilla flat is prepared with contoured, permanent raised beds, we can seed some of those beds with a buckwheat cover crop to prevent weeds from establishing. Buckwheat is an early season cover crop that is also very quick. You want to cut it down about 40 days after seeding and then you can transplant vegetables right into the green manure.

The Sorghum-Sudangrass should be seeded in early-mid June in areas that will be fallow for the season. It will grow fast and will get too tall to manage if it is not mowed frequently. Once it is up past your knees you can mow it down without hesitation. Mowing also promotes growth of the root system which will make it better at breaking up soil compaction and adding organic matter to the soil. It forms a dense canopy and will suppress the growth of most weeds. It should work to just mow and then broadcast the Sorghum-Sudangrass seed. This may give a lower germination rate, but it is more important to preserve what soil structure there is by refraining from plowing even if you have to reseed some areas or use a heavier seeding rate.

**Scything**
The scythe is an ancient technology, but it is one example where old technology out-performs the new. Mowing with a scythe, besides being an excellent workout, does not require any fossil fuels, and does not require running the BCS or any other heavy mower over the fields. Once you get good at scything, it is faster than the Brush Mower attachment for the BCS, you will never want to use a gas-powered mower ever again! In addition, the scythe is the only way to mow cover crops on the raised beds on tortilla flat. The brush-mower on the BCS is too wide and unwieldy to mow over the raised beds.

We have two scythes at Dilmun, a heavier Stamped steel ditch blade that is perhaps one hundred years old, and a brand new lightweight grass blade we bought from Johnny’s last year. The heavier blade is better for mowing the sorghum or clearing brush and golden rod. The light blade will chew through grass and rye as well as the sorghum. Proper maintenance of the scythe involves constant cleaning and honing of the blade during use, and peening every month or so. A scythe blade should be razor sharp, and can be as dangerous as it can be effective. Although we think that everyone should learn to scythe and that scything is an important tool for small farmers, for safety reasons, volunteers should not use Dilmun scythes.
Once the weather warms up in the spring, a Scything demonstration and training should be given to new managers. Scything technique is tricky, there are many videos online showing proper technique, but it takes some getting used to, and also some time adjusting the scythe handles to their most ergonomic position. The placement of scythe handles is based upon the measurement of the user. A properly adjusted scythe is necessarily for one to scythe efficiently and without injury. New Managers will have to find what set-up is right for them.

**Irrigation and Water Access:**

**Water sources on the Farm**

**Cornell Orchards**

Our most important water source on the farm is the underground irrigation, which is sourced from the Cornell Orchards. It is attached to the orchard line that feeds their blueberry bushes and organic vineyard. Although it is municipal water, and therefore potable, the condition of the pipes is unknown and as they are probably old, we don’t recommend drinking the water. We did wash vegetables in this water though, and now have a water cooler service to allow us to avoid drinking the irrigation water. A more sustainable system could be devised in the future for potable water. The mainline valve is the at the east end of the farm by the fence shared with the Orchards. Call the Orchards to turn on the water when you start to need it, because they will likely not turn on the irrigation themselves until later in the season. They may turn it off sporadically throughout the season for maintenance; feel free to call them (they are very nice and willing to help) to turn it back on if they do not remember to do it themselves. They turn off the irrigation for the winter sometime in mid-Fall, so keep that in mind. With the drought we had over the summer, the irrigation could not have been more of a life-saver!

In addition, last year the managers built and installed a sink that can be connected to a hose that connects to an irrigation line that goes down the hill past the swales. This sink is great for hand washing and veggie washing, and a 100’ hose for this sink can be found in the barn. We also moved the stainless steel sink that used to be in the back corner of the farm by the fence-line to the barn area, and if a new (connector?) is purchased to hook up this sink, it could be invaluable for washing vegetables.

**Rainwater Handwash Station**

On the south side of the barn there is a hand-wash sink that should be hooked up to a cistern that is filled by the barn’s gutters. This water is fine for washing hands, but is low pressure and not definitely potable. Fast Orange Pumice Soap is great for washing hands at this sink
because the grit is helpful when the water pressure is so low. The pump in the current jug of soap doesn’t work because the straw is split, so we would recommend buying a new jug and keeping the old jug as a refill.

NOTE: The sink is currently disconnected because there was no filter between the gutter and the barrel, and thus is got clogged up with leaves and other debris. It would be a good idea to make and install some sort of filter before hooking this sink up again. The sink is helpful when the irrigation isn’t turned on.

Well Behind the Barn
There is a well behind the barn next to the Pioneer Garden. It is powered by an electric pump and you can easily attach a hose to it for watering those raised beds. The water from this well is not potable and is not good for drinking. We did wash some produce with it but it is recommended that you use the irrigation water from the Orchards for this purpose. You can turn the pump on by flipping switches 17 & 18 in the breaker box in the side room of the barn basement. These should be turned off when you are done using the pump for the day. We had a couple of instances when the pump didn’t work towards the end of the summer, but it didn’t prove to be a permanent problem.

Irrigation Schematic for Tortilla Flats

Our irrigation system is very simple, drip tapes come out of the mains as needed. The 2” main line supplies most of the beds. There are many valves already attached, and more can be added as needed. Drip tapes are easily attached at these valves as needed. Kinks in the line should always be avoided, when deployed and when in storage; however 2” line is good in that it can still deliver adequate pressure while kinked and is less likely to be permanently damaged by such treatment
(although it is still vulnerable to lawn movers and accidentally placed shovels). 1” pipes were attached to the mainline to reach the two small beds that lie perpendicular to the rest of the field. The advantage of 1” line is that it can be attached with the same simple valves as the drip tape, which means that you do not have to put a T junction in the line. As for the unconnected ends of the thicker main lines, the rubber stopper is not strong enough to stop the water from gushing out at the end. We folded the end over itself and used a strong hose clamp to tighten it down that way.

In 2013, there will be a different irrigation schematic, and a 2” line will have to lie perpendicular to the main path at the top of Tortilla Flat, and the tapes will branch off and go the length of the new horizontal beds. Most likely this will require some sort of T or L junction.

The tapes have been wrapped around various buckets/ spools etc, and wrapped with masking tape. These have been labeled with their length as best as possible. However, with the new bed system, you may have to splice some lines together to make them long enough. This can be done with the yellow coupling pieces found in the tool room. We also would suggest getting more wooden spools with a large diameter for storing the irrigation tape. They should not be wrapped too tightly to prevent kinks, and the spools seem like the most convenient storage option for rolling and unrolling the lines. The lines may need replacing within the next few years.

**The Wash Station**

Although we did not use it this year, there is a large gravel drainage pit at the top of the field for use as a wash station. Washing produce there avoids the creation of a mud pit and allows for water to drain through the rest of the field. The managers last year attached a garden hose to a normal drip-tape valve with a piece of vinyl tubing and hose clamps. This worked, although there was a little bit of leakage. They used two of the large blue 55-gallon barrels as the “Hydrocoolers” and wash bins. These should be scrubbed out and rinsed prior to use for the season. Try to dump these into the center of the drainage pit, and try not to dump them all at once, as the torrent of water will wash gravel out of the pit.

**Troubleshooting Irrigation Issues**

**I cannot find the irrigation system!**

The mainline is stored in one of the large side sections of the basement. Drip-tape and smaller lines are stored up in the loft. The grey cabinet in the tool room is full of miscellaneous irrigation hardware (such as the splicers and the valves for attaching the drip-tape to the mainline).

**Not Enough Pressure**

If there is not enough pressure there is either a kink in the line or a leak somewhere. There are many old hydrants on the farm still connected to the system. Most of them are safely plugged, but sometimes they may burst. If you suspect this, scout the farm and see if any of these have burst. The main culprit two years ago was the hydrant by the Old Market Garden. It was fixed, but may still burst. Also, the water may just not be on, so check with the orchards. They may have temporarily turned off the system for repairs.
Too Much Pressure
Although the last year’s managers installed an inline regulator at the beginning end of the mainline this year, there may still be too much pressure, which can cause drip tapes to burst, or over-watering. Be sure to have a number of drip tapes open at once (at least 6-8) to prevent this from happening. If drip tapes do burst, they can be quickly and easily fixed with the yellow coupling pieces we have in large supply in the irrigation cabinet.

Things do not attach to other things
Plumbing parts come in different diameters and gauges, with different types of threading, and are made out of different types of materials. These factors can cause parts to not work well together for many reasons, and although parts are not expensive, keeping these things in mind can save you a lot of time and trips to the plumbing store. Also, try to use thread sealing tape on threaded connections. It helps keep the seal watertight and can make pieces easier to disassemble in the future.

Most irrigation pieces are attached using barbed fittings and hose-clamps. If you are getting blow outs, check to see if the fitting is the right size, that the barbs are not worn down, and that the hose clamps are tight enough.

There are two types of pipe threading on the farm: National Pipe Threading (NPT) and Garden Hose Threading (GHT). NPT is the standard for most American pipe fittings, but garden hoses and their fittings are an exception. To fit a garden hose to the main irrigation system you will need a proper adapter, these adapters are cheap and easy to find at most hardware stores including Agway and HEP.

Pipe fittings can be made of a number of materials, including a number of different types of plastics and metals. Take care (or even avoid) mixing metal and plastic parts. Metal threading is hard and sharp, and can easily cross thread a plastic piece when you try to attach them. This can lead to leaks, or at least make it very hard to disassemble.

Although it may be nice to find the exact right part and adapter for every situation, it may just be easier to fit a small length of flexible vinyl tubing over the offending parts and strap the whole thing down with a bunch of hose-clamps. In some cases this may be a better and simpler solution than chaining a bunch of different adapters together.

Suggestions for improvements
A PVC union piece between the regulator and the ball valve at the market garden hydrant will make attaching and detaching the mainline much easier.

A pressure gauge for the market garden would be useful. We developed a good qualitative understanding of our system over the season, but a pressure gauge is necessary to properly measure water usage and be more precise with our irrigation.
Pests and Diseases

Brassica Flea Beetles (*Phyllotreta cruciferae*)
As in previous years, these small leaf-feeding beetles were one of the most problematic pests. They attack mainly the Brassica family crops, but have also been seen to attack other plants, such as eggplant. They emerge in the spring and feed heavily on the Brassicas, especially cotyledons and young leaves. They cause at first a shotgun spattering of small holes in the leaf, although after heavy feeding, leaves can die off completely or be completely chewed away.

As the plants got bigger, they tended to grow out of their flea beetle infestation, either through subsidence of the flea beetle population or by the maturation and toughening of the leaves. However, the beetles made much of our early kale crop unsellable, and delayed some other crops’ growth. We suspect the problem was especially intense this year because in other years, rain may help wash the beetles off the plants, but this summer’s drought allowed them to proliferate.

We used some diatomaceous earth (silica powder made from rock formed from fossilized diatoms) as a deterrent, but as in past years, this was not very effective. In previous years, Surround, a kaolinite clay based spray has proven effective against flea beetles.

Row covers are probably one of the more effective and cost efficient solutions available to us. Our flea beetle issues could have been lessened if we had row covered all of the Brassicas immediately after transplanting, which was evident by how much better the things we did cover looked. The physical barrier of the reemay will not completely keep them out, but it will slow them down long enough for the plants to get ahead of them. Once the reemay is lifted however, any beetles that get under it will be trapped in there and do major damage, so the row cover is not good to recover any plants that have gotten exposed.

Striped Cucumber Beetle (*Acalymma vittatum*)
Just as in previous years, cucumber beetles infested our squash plants and devastated many of them. They attack the squash blossoms, leading to poor fruit set, and they are also a vector for Bacterial Wilt, a disease which afflicted many of our squash plants.

We did not have any effective control strategies against cucumber beetles. We did some hand-squashing and tried using diatomaceous earth, both to no avail. A recommended measure might be to row cover immediately after transplanting. Hopefully the rearrangements of the beds might help with the pest problem, but with such a small plot, the beetles travel easily from one bed to another.
Squash Bug *Anasa tristis*

These invasive stink-bug like insects were another bad cucurbit pest. They suck at the base of the stems of the cucurbits, making many of the plants break at the base of the stalk. Again we tried controlling these by hand and with the diatomaceous earth, but they also persisted in the face of these methods. Between squash bugs, cucumber beetles, and bacterial wilt, we lost more than half of our squash plants before their peak productivity over the season.

Septoria Leaf Spot *Septoria lycopersici*

This is an ascomycete fungus that affects plants of the Solanum family, especially tomatoes. It also affected our eggplants. This fungus is visible on the leaves, mostly towards the bottom of the plants. It appears as black spots and often the leaves turn yellow. Heavily affected leaves can fall off and expose the fruit, which may result in sun-scalding. Although it does not remain in the soil itself, it can persist over several years on plant material in the soil. We recommend ensuring any plant matter that is composted at the end of the season will not be used as compost for several years. It did not heavily damage our tomato crop this year.

Powdery Mildew *Podosphaera xanthii*

Powdery mildew is transported by airborne spores. It came later in the season than the Bacterial Wilt, and looks like a powdery white dusting on the leaves of the plants (similar to the diatomaceous earth). It didn’t seem to have a huge effect as by this time many of the plants had already succumbed to other pests and diseases.

Late Blight *Phytophthora infestans*

Late blight is caused by an oomycete pathogen and affects the leaves, stems, fruit, and tubers of tomatoes and potatoes. It is the disease responsible for the Irish Potato Famine. Although we didn’t really have a problem with late blight, it is good to be aware of it. It did affect a community garden not far away. We had a Cornell Cooperative Extension worker come to check our plants for late blight and other disease in the late summer.
Meadow Vole *Microtus pennsylvanicus*
Voles, small rodents that resemble mice, were a pretty large problem for us this year. They tend to like to live under the black plastic and nibble on everything from tomatoes to pumpkins. They actually seemed to make homes in our Blue Hubbard squash. Tomatoes that had even just a small nibbled area couldn’t be sold. The best preventative is to keep grassy areas mowed relatively short, as the voles live in tall grass. The closer the grassy areas to the crops, the more likely the voles are to move from one to the other.

Groundhog *Marmota monax*
Groundhogs can cause a lot of problems, and were the biggest mammal pest last year. This year they were less of an issue, but we did use two of the 4 spring action kill traps given to us by Campus Area Farms. Previous use of Have-a-Heart traps has not been very effective, nor in reality, particularly humane. It is illegal to transport groundhogs without proper licensing, so any captured groundhogs would still have to be killed. Last year, the traps killed 28 groundhogs, effectively eliminating the problem. We only killed five or six this year, mostly because we didn’t have the traps set very frequently. The kill traps prove to be a more effective, and in practice more humane means of wildlife control.

There are several burrows near Tortilla Flats and the BMP beds, some of which are more actively used than others. These are a bit of a hazard for tripping, tipping wheelbarrows etc, so be sure to mark them and point them out to groups. There is a burrow near the fence to the left of the main gate at which we caught several groundhogs. Once set, these traps really need to be checked every couple of days. A few times, we forgot to check them right away, and would find a half-eaten, very bloated, or very rotten carcass (not pleasant). We would then chuck the groundhogs over the fence up the hill beyond the bee hives using a shovel.

The traps that we have are potentially dangerous. Be sure to be properly instructed in their use, and to wear gloves and to use the setting tool when you are using them. It is important to unset them when there are groups or dogs on the farm, and to use bright plastic flags to mark their location (which can also be used to keep the traps from flying far once they’ve been triggered).

Deer *Odocoileus virginianus*
Deer can be a potentially devastating pest, but with our deer fence, the problem is mostly avoided. We did have a couple of deer get in once (a doe and fawn), when the main gates were accidentally left open overnight. They did not prove to be a huge problem, but chasing them out was a bit challenging. Once they’re found, they need to be essentially corralled down to the main gate. We would recommend making a sign that says to please shut the gates that could be hung on the main gate. Because Dilmun is open to all visitors, it is important that everyone knows and remembers to close the gates to prevent deer issues.

Bacterial Wilt of Cucurbits *Erwinia tracheiphila*
Bacterial wilt is a bacterial pathogen that causes rapid wilting symptoms in cucurbits. It is vectored primarily by the different varieties of cucumber beetle. Control of this disease is mostly based on
control of the insect vectors. Summer squash and cucumbers are much more susceptible than winter squash. Resistant varieties are becoming available, so it may pay to experiment with them in future seasons. It can be disheartening to find a wilted squash plant that looked beautiful and healthy the day before.

**Growing Spaces**

**The Pioneer Garden**
The center three beds of The Pioneer Garden were built in 2010, and the outer two were built in the fall of 2011. The beds are composed mainly of CU compost and have sides made out of Black Locust planks. The outer two are also bottomed with cardboard to decrease weed pressure. These beds can go into production much earlier than Tortilla Flats. Especially if you row cover them, they will warm up early in the season and are a good place to grow crops like radishes, spinach, arugula, and lettuce. Later in the season, they are good for growing root crops like carrots and parsnips that do not do as well in the heavier soil up on Tortilla Flat. Deer and groundhog predation is the primary issue in the Pioneer Garden. We found that a combination of row-covers and black plastic mesh did a good, but not perfect, job keeping the rodents and ungulates out. In the future, a 10ft deer fence around this area would allow us to better take advantage of this space.

We recommend maintaining a deep layer of compost in the beds, so it would be best to add some more at the beginning of the season. It is also a good idea to weed whack around the beds. Be very careful of the stakes that hold the sides of the beds in place. They present a tripping hazard, especially in combination with the black plastic mesh and tall weeds. They are beginning to be more angled into the paths as the sides of the beds bow out. Perhaps they will need to be repaired soon.

In addition, this year we created a permanent asparagus bed adjacent to the pioneer beds. As this is the asparagus’s first year, it should not be harvested for another couple of years to allow it to grow heartily. We also built the wooden component of a cold frame over one end of the left-most pioneer bed with the new Outdoor Odyssey Farm Trip group to allow for season extension. This needs to be insulated with plastic or glass somehow; perhaps old shower doors from the Recycle Center could be useful. Lastly, we also used the area beyond the Pioneer Beds for planting potatoes. This area was tilled and made into beds. Because the area is not fenced in, we used upside down unrolled tomato cages as protection for the rows. We covered this with plastic mesh to make the gaps finer. It is not an optimal system because it is hard to access the plants with the cages on them, but it allowed us to grow a lot of potatoes!
Tortilla Flat
Tortilla Flat is the main growing area of the farm. It is about an acre in size, although in the rotation, about 1/3 of it will be in cover crop during the season. It has very heavy, clay soil. In 2011 the Tortilla Flat did not dry out until mid-late May. We did not have this problem in 2012 because the conditioners were much drier. If the ground is very wet, tilling is not the best idea and will have to wait until later, as it can cause compaction and create large soil clods.

The soil on Tortilla flat is too dense to direct seed most vegetables. Field crops like sunflowers, corn, and broadcasted seeds will germinate, but for vegetables where you need more precise germination, it is best to do them by transplant.

Up until 2012, this area was in beds that paralleled Rt. 366 (except for the “perpendicular beds”) and divided into crop families, with four to five beds for each family. This is not the best orientation for the beds, as it increases erosion. We have decided to create new beds that will be contoured to the land and will lie perpendicular to Rt. 366. They will be much longer than the old beds, and thus there will be fewer per crop family. There will be a couple of paths that intersect the beds, and we hope these beds to be relatively permanent as we move to a no-till system.

Best Management Practices Area (BMP)
As the research on this area is finally complete, we can now grow and sell vegetables in the BMP! We have also referred to this area as the Market Garden Annex (MGA), and this or another new official name might be nice in the future. The BMP is made up of four large sections, which are divided into two beds each. We grew broccoli, peppers, pumpkins, parsley, carrots, lettuce, and beets in the BMP. It was great to have the extra space. However, the Best Management Practices must be maintained, which include maintaining two feet of compost on top of the native soil.
Because we had Tortilla Flat chisel plowed for the new beds, we planted your garlic crop in the BMP in a couple of the beds. In addition, last season we planted sorrel, which is a perennial crop, and did not remove it. Therefore you will have sorrel next year, but do not have to keep it if it is not in your best interest.

**Markets and Sales**

Set up for markets can be hectic, but once you get the system down it becomes much easier. On the Ag Quad you can get tables from the circulation desk at Mann Library, although you have to reserve them ahead of time (can be done through the Mann Library Website, you can also reserve conference rooms for meetings and events this way) during the semester. The Campus Farmer’s Market is now also on the Ag Quad, so we reserved a library table for this as well. In the future it would be nice if we had our own table close by or were provided one by Farm2Cornell, as Mann sometimes needs the tables.

The bike carts are invaluable for bringing produce to market on campus. You do not have to worry about parking or any of the other numerous regulations about cars on campus. In addition bicycling is a big part of Dilmun culture and our mission of sustainability. Most importantly, you get to look really cool when you are hauling a load of veggies through campus on a bike cart. The carts can hold up to 100lbs, but up to 60 is more reasonable. Loading the carts safely and in a balanced fashion can have more of an effect on the performance than the absolute weight of the cargo. We use the big navy tubs and stack the crates inside these. We would recommend purchasing a few more heavy-duty bungee cords to strap them down as some of the buckles have broken. Make sure your tires are filled and your brakes are working. A loaded bike cart, a down-hill, and failing brakes are a bad combination. We also suggest leaving the bike cart with the more permanent metal attachment on the Dilmun bike, or on another bike that will be reliably used for every market, and storing the plastic attachment for the other trailer in the barn. Occasionally we were short a bike trailer if one of the attachments was on a bike that wasn’t at the farm. The Dilmun bike could use some tuning up (i.e. new brake pads). The combination to its lock is 1989.

**Summer Markets**

During the summer we had a stand on the Aq Quad from 12-3pm. We tried to be outside as much as possible, and in the shade. We recommend bringing a spray bottle with water and filling a shallow bin with water from Manndible to keep leafy greens cool in the summer heat. We go through plastic grocery bags very quickly!

**Fall Markets**

During the fall we had markets with the Campus Farmer’s Market on Thursdays from 11-3pm. This took some coordination because all of the managers had different schedules and couldn’t be there for the whole time. The market moved from Ho Plaza to the Ag Quad this year, which was convenient, although we had to make sure we could use Mann library’s tables. We generally harvested most things for market on Wednesday, brought them to the Pomology
Cooler, and harvested the more wilt-able veggies on Thursday mornings. The market was a bit hectic to set up and we usually weren’t ready until 11:30, but Betsy and a dedicated volunteer really helped smooth out the process. We kept the tent, lockbox, and scale in Betsy’s office, and the sign and chalkboard in the Plant Science lounge. It’s always good to have a lot of rubber bands, quarters, bags, and chalk. We sold a lot of veggies at the market and the atmosphere was really great.

This year, we were approached by someone who wanted to have a post-market “CSA”. He came by every week, paid $15, and took many of the leftover vegetables. This worked well to sell some of the remaining things, and it was great that he was willing to pay and take veggies no matter what we had left. While the farm can probably only support a few people for a CSA, if someone reaches out to you, we suggest considering it.

**Roadside Stand**
We started a roadside stand this year! We built a table out of old pallets and painted signs for produce. We purchased two red coolers and used these to store veggies on the table. The stand must be back from the road, so we put it near the sign with the map on it. We put a “Fresh Produce” sign by our main sign, with an arrow that pointed to the stand. We also painted a lot of produce signs with some kids’ camps, which ideally would be strung together and hung from the stand or sign, so customers could see what is available. There is a removable money box which is fed through a slat in the table. Although we only set it up a few times, the stand could be a valuable way to sell extra vegetables and we recommend continuing to use it.

**Manndible Cafe**
In past years, Manndible has been a big customer for Dilmun veggies. Kathleen Pasetty (owner) is a great resource and very understanding and flexible with managers as they are learning to figure out farming, harvesting, and distribution at the same time. Manndible often purchases kale, red slicing tomatoes, cabbage, broccoli etc. This year, we didn’t sell as much to Manndible as the year before because our kale crop had a slow start. We probably should have also grown more of the slicing tomatoes. We did sell to them a few times though, and we generally left the produce in the Pomology Cooler with a printed invoice. We suggest trying to have more vegetables to sell to Manndible in coming seasons because they are a great customer, very flexible, and will advertise the Dilmun produce.

**Mexeo**
This year, we began selling to Sebastian Villa who owns Mexeo restaurant in Collegetown. He is also hoping to open up a food truck behind Sibley, and is interested in purchasing vegetables
for that as well. We informally sold and gave him hot peppers, herbs, and other vegetables in exchange for volunteering. He came to several work parties and sold Vietnamese food with our veggies at the Campus Farmer’s Market. He is a great resource and expanding business with him seems like a good idea.

**Cornell Outdoor Education**

For the second year in a row, we have sold some vegetables to COE. They like to purchase in bulk for a couple of key events towards the end of the summer. We sold them tomatoes, onions, and peppers this year. It would also be great to continue this relationship, as many students on campus have ties to COE and Dilmun Hill.

**Volunteers and Work Parties**

We had some great and dedicated volunteers during the Summer and Fall. There is an average of around ten people at each work party, and some have quite a few more! While it is challenging to manage so many people, their help is invaluable. We recommend having several activities planned for each work party, as a group of volunteers can get through a project amazingly fast (something you expect will take an hour can be done in 15 minutes). It is also good to have big and daunting projects planned for the work parties, such as composting the BMP beds, which would take MUCH longer without volunteers.

Our summer work parties were Mondays and Thursdays 4-7pm, so that people could join us after work and avoid working in the heat of the day. Fall work parties were Thursdays 4-6pm and Sundays 1-4pm. It would have been better to have a work party the day before market so volunteers could help harvest, but unfortunately we couldn’t make this work with the manager’s schedules. Having markets and work parties on the same day is not recommended because the managers were pretty tired by the end of the day. We moved our Sunday work party later than the 11:00 AM start time of the previous year’s work parties to allow for religious practices.

We sent reminder emails once or twice a week over the listserv to remind people of sales and work parties. It has always been a manager’s prerogative to come up with a unique and entertaining email style. Over the years it has ranged from whimsical poetry to hidden links to interesting Wikipedia articles to farm-related puns.

As in the past, we gladly gave away plenty of hard earned veggies to our volunteers. People love the veggies but are shy about taking them. Definitely push them on the volunteers (nicely) or you will get left with a lot! In the beginning of the season, we had some extra veggies that we brought to Loaves and Fishes, a local soup-kitchen downtown. They are more than glad to take veggies during their cooking hours; the contact info is on their website. Potlucks are also a great way to build community and to share the bounty of the farm. Many people attend them!
Collaboration, Outreach and Recruitment

Dilmun hosts many visitors in the form of Cornell classes, summer camps, and other groups interested in sustainable agriculture.

Classes at Dilmun

- SNES 1101 Intro to Environmental Science
- HORT 1101 Horticultural Science and Systems
- CSS 2600 Soil Science
- HORT 2200 Sustainable Landcare
- HORT 4260 Practicum in Forest Farming
- HORT 2400 Exploring the Small Farm Dream
- HORT 4940 Permaculture Design Certificate Course

Outreach

This year the farm had many groups come to visit, including 4H student groups, Cornell Outdoor Education Climbing and Outdoor Adventure summer camps (two groups every Wednesday for four weeks), and Exploring the Small Farm Dream. Although dealing with these large groups can be hectic, it is great to get the word out about Dilmun to so many people, and often we had a great time with the groups.

For the first time this year, COE had a farm-focused Outdoor Odyssey Trip. They collaborated with Dilmun Hill, camped on the Dilmun land for a couple of nights, and reserved 2 days to work with us on a project. We chose to build a cold frame for the left-most Pioneer bed with them. Although the frame still needs glass and/or plastic sides and cover, this could be beneficial for future season extension. It was a great group and we hope that they continue to put on this trip and collaborate with Dilmun.

For recruitment, we tabled at the Green Fair in the beginning of the semester. We forgot to reserve a table for the Club Fair this year and were able to share with another group, but we recommend remembering to get one! Although these events do not feel very productive, and a lot of people sign up who never make it out to our farm, some of our top volunteers were first contacted at these events. Tomatoes and other samples were popular and were a great way to draw peoples’ attention. The Plant Science Department orientation meeting for freshmen and new transfers is also a good way to get the word out to people as soon as they reach campus.

This year we also expanded the use of our Facebook page. We have a group page, where we upload pictures and post information about work parties and markets. In addition, we made a new poster for Plant Science that is intended to be relatively permanent. The top half of the poster has general information and will stay the same for future years. The bottom half is separate and can be reprinted with information about the current managers, projects, and work party/ market times. Contact Craig Cramer for help with this. We also made a new copy of the Dilmun logo and onion, so these are also available to use for fliers and other documents. Craig
put a slide for Dilmun on the TV screen in Plant Science as advertisement, and this is probably possible again.

Crops in Review

Brassicaceae

Brassicas are really important staple crops that folks expect to see at the farm stand, and while they may seem pretty unexciting when compared to things like tomatoes or squash, they consistently sell pretty well. As far as growing them is concerned, brassicas require a bit more care and time than would be expected. They are fairly heavy feeders, and should be planted with a good amount of compost. The larger, longer season crops like kale should be fertilized with fish emulsion about every two weeks to maintain productivity. For all the brassicas, flea beetles are a serious concern, especially early in the spring when the plants are young. We recommend row covers for all transplants. Another pest control method we read about but didn’t get a chance to implement was using trap crops. You can plant a fast growing brassica such as radishes in the bed with your more valuable crops (broccoli, kale etc) and hope that the flea beetles go after the radishes instead of the cash crop.

Kale: Ripbor, Redbor, Toscano, Red Russian- In general, our kale crop was weak this year mainly because of the pests and weather. First of all, we did not cover all the transplants with row cover, and the ones that were exposed got hit really hard with the flea beetles which stunted their growth. Even the rows that were covered had intense damage. We thought the kale would be most vulnerable when it was young, so we took off the row cover after the transplants were established (maybe after 2-3 weeks) but as soon as they were exposed the flea beetles went crazy on them. Besides the pest problems, we also had a very hot and dry summer, which further stressed the plants and stunted their growth. In terms of fertilizing, the managers last year recommended spraying with fish emulsion every 2 weeks for kale because it is a heavy feeder, but we did not fertilize that often. We sprayed them probably 3 times throughout the season, but they probably could have benefited from more fish emulsion.

In terms of the varieties we planted, the Toscano seems to have the greatest tolerance to the flea beetles and weather, considering it was the first variety we were able to harvest and they looked the best. The Redbor was fairly bitter even into the fall, so we did not harvest much of it. The Winterbor, which is the curly green typical looking kale, did just alright this year in terms of pests and weather, but has a great flavor and is very popular at market. By the fall markets, we were making bunches of mixed-variety kale and they sold VERY well. We often had to go back to the farm to harvest more if we sold out. We could have sold even more, and wished we had more planted. Kale is also a crop that Mandible is potentially interested in buying, so we would recommend planting tons of it. So far, no one has seemed to hit the maximum amount of kale that can be marketed, so the sky’s the limit!
**Broccoli:** Arcadia, Belstar- We planted half a row of the Belstar variety in Tortilla Flat, which did not do so great. We planted them too close, so we would definitely suggest giving them lots of space to avoid crowding. This variety was not very heat tolerant, and the hot dry weather prevented them from having nice big heads. The heads were very uneven, and some plants didn’t seem to produce heads at all. Although we were able to harvest small stems of broccoli and bunch them together, this row of broccoli was fairly disappointing and bolted quickly. We also planted 140 plants of (the other variety) in the BMP, which did much better. These heads were small but much more even, and we were able to sell quite a bit to Manndible. Once we cut the heads, the plants still send up smaller shoots which we harvested, bunched, and sold successfully for several months at market. They were popular at the stand, and we also sold some to Manndible. They are a great crop to have, especially since we harvested from them for so long. The differences in success for the two areas planted are probably due to varietal differences. We would recommend planting a heat tolerant variety of broccoli and plan for it to head later in the summer so it’s not exposed to so much heat.

**Cauliflower:** Skywalker- The cauliflower was late and the heads were fairly small, but we were able to harvest several nice looking heads a week through the end of the summer and early fall. They sold surprisingly well at market and were delicious, though the managers didn’t get much of the crop. We would recommend growing more of it, since we only did half a row and could have sold a lot more. They always sell very well at farmstands, and fetch a much higher price than broccoli. The variety we used this year, Skywalker, is self-blanching, meaning that the leaves are very upright and keep the cauliflower shaded to maintain nice white color. Based on its success despite a really rough growing season, we think this is probably a good variety to stick with.

**Radishes:** Cheriette, D’Auvignon, Easter Egg- radishes are a good early season crop for when there isn’t much else to bring to market. The first few markets this past year were mainly spinach and radishes grown in the pioneer garden. Although we did sell some of bunches, and they looked great on the market table, they were not particularly popular. That being said, I think we would definitely grow them again just to fill out the early market stands and admire their beauty.

**Kohlrabi:** Azur Star, Kossack- This year we planted half a row of kohlrabi, half in each variety. Kossack is a large green storing variety and Azur Stars are smaller and a nice purple color. The kohlrabi did not do well, to say the least. They got a slow start from flea beetle damage and were heavily attacked by slugs later in the season, especially when it rained. We only sold a few pretty ugly kohlrabis very cheaply at the market stand. Last year, however, the kohlrabi crop proved much more successful, and thus we do recommend trying them again. We suggest covering them with reemay in the beginning of the season to keep flea beetles off of the young plants, or only doing a later planting when the beetle pressure is lower.

**Cabbage:** Farao, Alcosa, Storage #4, Super Red 80, Deadon, Minuet. We had six varieties because we got leftover seed from an IPM project. The cabbage did fairly well and it was nice to have a variety to compare how they grew. The Minuet Napa cabbage variety did poorly because
it was badly flea beetle damaged, but perhaps it acted like a good trap crop. The Alcosa variety did well, as did the Storage #4. We sold some cabbage to Manndible and it sold fairly well at market, so we recommend growing cabbages again and would suggest growing both red and green varieties.

**Brussels Sprouts:** Diablo- The Brussels sprouts grew well and sold well at markets. We would suggest planting more, making sure they will be ready mid-Fall (plant them in June). It is important to cut off the tops of the plants in mid-September in order to help the plant focus its energy on the sprouts. We began harvesting sprouts just before winter break, and they were a great crop to have at some of the last markets as many of the other veggies ended their seasons.

**Arugula:** Astro- This was another nice early summer crop for markets. The arugula was planted in the pioneer garden, and harvested for a few weeks before it got too hot and started to bolt. The leaves had great flavor, and made a delicious addition to some of our bagged lettuce mixes that sold well at market. We recommend seeding and immediately covering with a row cover to protect them from flea beetles. Overall, it has great selling potential.

**Cucurbitaceae**

**Cucumbers:** Corinto- The cucumbers this year were not great, due mostly to a lack of attention. We did not plant very many, maybe 15 transplants. More importantly, however, the bed they were planted in did not have drip line, and so they didn’t get nearly enough water all season. The plants were very small and sad looking, as were the cukes. We sold many of the small (baby) cucumbers at market, but I think if we’d had big, juicy cukes they would have been very popular. It is important to get all the irrigation set up before the craziness of June sets in, otherwise some crops may get neglected.

**Summer Squash:** Costata Romanesco, Sunburst, Yellow Pattypan- We planted a full row of summer squash on black plastic, which should have amounted to TONS of squash, but due to pest pressure we had significantly less. What happened most likely was that the squash and cucumber beetles came in, did a fair amount of damage to the leaves and fruit and carried in some nasty diseases. After a few weeks of heavy insect pressure, the plants started wilting and dying, probably from bacterial wilt. Soon after that, we got powdery mildew and things really took a turn for the worse. At this point, we were probably losing a plant a day, and by the end of July or so the summer squash was long gone. Surprisingly, however, the patty pan squash survived the many pest attacks (possible resistance?). We would still recommend the managers
plant summer squash next year because despite the heavy pest pressure, we were still able to harvest a good bit of squash, which was popular at market. One thing to note however is that customers at market prefer smaller squashes even though picking them young reduces overall yield. Often at market we would immediately sell out of the smaller squashes (6-8 in) and we would be stuck with a few giant zucchinis.

Winter Squash: Butternut, Blue Hubbard, Baby pam pumpkins- Our experience with winter squash this year was quite a roller coaster. It started out on a great note, as we planted butternut squash early/mid summer to have squash to sell in the fall. We planted them in the remaining space in the cucumber row, and they produced beautifully for a good 2 or 3 weeks before the diseases started migrating from the summer squash to the winter squash just one row over. It seemed the plants suffered from powdery mildew more than anything else. Despite the disease, we had a fair amount of butternut squashes at market in late summer/fall and they always sold out. After enduring the loss of so many cucurbits already this season, we decided to follow the advice of last year’s managers and try to separate some of the squash from the already diseased zucchinis and butternut squashes. Therefore, we turned one of the BMP beds into a pumpkin patch with the help of one of the kids groups that came to Dilmun. We also planted Blue Hubbard squash on either ends of the bed to act as a trap crop for insect pests. Once the transplants were established and were getting irrigation from the dripline, they took off and grew extremely well into a lush pumpkin patch. Soon, we were seeing lots of small green pumpkins starting to develop. The problems started, however, when we began to notice vole holes throughout the bed and little rodent bites in the fruits. As the pumpkins progressed, so did the voles and soon the squashes were becoming homes for the rodents. The interesting part was that the Blue Hubbard squash was acting as a trap crop, but with the voles instead of insects. The voles seemed to prefer the Blue Hubbard squash as their dwelling, possibly due to their large size. However, as soon as we harvested some of the Blue Hubbard squashes, they quickly moved on to the baby pam pumpkins. Many of the pumpkins we harvested had vole damage and were unsellable. And to add onto our squash problems, we got a hard frost midway through the pumpkin season that destroyed the plants. All that being said, we did not have much of a disease problem with the pumpkins and Blue Hubbard, so separating the cucurbit crops to avoid the spread of disease seemed to work very nicely.
Amaranthaceae

**Beets**: Bull’s Blood, Touchstone Gold, Chioggia Guardsmark- The beets this season were a great asset to our market table as well as the managers’ diets. Early transplanted beets did extremely well in the market garden, as did beets seeded in the BMP beds. Out of the three varieties we used, the Chioggia Guardsmark far outperformed the other two. We are unsure of why this is, especially since the managers the year before found that the Touchstone Gold did best. It may have to do with weather conditions, since our season was so hot and dry. The Chioggias may be more tolerant to this type of weather. We would still recommend planting all three because mixed variety beets bunches looked beautiful and consistently sold well at market.

**Swiss Chard**: Improved Rainbow Mix- Swiss Chard is actually the same species as beets (Beta vulgaris), and therefore like the beets its “seeds” are actually multi-germ fruits. In the greenhouse several plants will emerge from each plug, and these should be thinned to a single robust plant as early as possible without damaging the remaining one. This chard did extremely well despite drought conditions. We had dripline for most of the row, but even the plants at the very end that weren’t supplied by the irrigation did well. Our first planting produced from the end of June until we plowed them down towards the end of October! We planted the second batch quite late in the season, so they didn’t have as much time to get established but they did produce as well. We had lots of chard at every market and it had little to no weed and pest problems. We definitely had our fair share of chard by the end of the season, and it doesn’t sell quite as well as kale, but it is definitely a good crop to have. Keep in mind that chard wilts quickly at market, so it is best to keep it in a shallow tub with water and to spray it with the spray bottle periodically.

**Spinach**: Regiment- The spinach we had in the pioneer garden did very well in the spring and early summer until it was decimated by hungry deer. We had the black netting on top of the bed, but realized that the deer can fit their mouths through the netting and chomp on our lovely greens. After that, we made sure to use the metal rings to suspend the netting at least a foot or so above the crops so they could no longer reach through.
Fabaceae

**Bush Beans:** Provider, Carson, Royal Burgundy- We planted three different varieties, a yellow wax, a green snap, and a purple variety. We transplanted more of the green than the yellow and purple, and all had a slow start. Before planting we used a legume inoculant to coat the beans. Once they finally got rolling, the beans did extremely well and we sold lots of them at market. Royal Burgundy was especially tender and vibrant but mostly lost their color and turned green when cooked. The color variety looked really nice at market and we often sold mixed quarts. We would suggest harvesting beans twice a week because beans left for a whole week can become too large and tough. These are a great veggie to have volunteers help harvest, as you have to bend over the plants to harvest the beans and it’s pretty time consuming. However, the plants are delicate so be careful not to rip them out of the ground, and don’t harvest them when they are wet, as that can spread disease. In the future it might be nice to experiment with a pole-bean variety, which might be less back-breaking to harvest.

**Dry Beans:** Kenearly Yellow Eye and Unidentified white beans- We planted almost 2 full rows of dry beans in the perpendicular beds and anxiously awaited all season for them to mature and dry out to harvest. We spent a work party in late summer pulling up the partially dried plants and laying them in the barn to dry further. A few weeks later, we had volunteers help us diligently pick the beans out of their pods. We found that some of the beans were moldy or discolored, and thought that maybe it was because the plants were harvested following some rainfall (the day prior). The plants and pods could have been still wet when we put them in the barn, and could not dry out quickly enough. We would advise next year’s managers to experiment with the dry bean processing, such as harvesting just the pods rather than pulling out the entire plant to store.

**Peas:** Sugar Snap, Dwarf Gray Sugar Snow- We direct-seeded a row with peas and later filled in the row with transplants in spring, but neither method proved successful. The plants barely made it to the bottom rung of our trellising system, which was probably only 6 inches off the ground. This could have had to do with lack of water, so we would suggest transplanting and giving the peas lots of water in drought conditions (even watering by hand if necessary). We didn’t end up harvesting any peas for market that we’d planted. However, we did harvest field peas that came up from last year’s cover crop. While these weren’t as tender as sugar snap peas, they were still tasty when young and sold really well at market. If the pea plants are successful, the peas are pretty sure to sell.

Alliaceae

Nobody is quite sure how or why, but Dilmun Hill has a supernatural ability to grow world class alliums. Last year (2011) the alliums were planted directly into compost filled furrows in un till ed sorghum residue. We think it may be possible to do strip-tillage onions like this again next year. In general you can’t really have too long of a season for most of the alliums, and it is really important to plant them in the greenhouse as early as possible in the spring (By March 1st if
possible). Make sure to plant deep enough that the bulbs are entirely underground, and keep tops mounded as necessary. Pest pressure was not an issue this year, and has not been historically. Alliums are not, however, competitive with weeds, so be sure to keep weeds clear and apply straw liberally.

**Onions**: Red Bull, Cortland- The onions did very well this year, as they always do at Dilmun. We had both red and yellow onions, and they sold consistently at market. We also sold a bit to COE for an event. We were a little too stingy, however, in bringing enough to market late summer thinking that we would sell the majority of them at market in the fall. Instead, we were left with many storage onions for the winter (which is nice for us!). We would recommend selling many of them as they are being harvested during the season or maybe finding another outlet for them (e.g. Manndible)

**Shallots**: Ambition- The shallots grew well and looked beautiful. We would recommend growing more of them because they are tasty and slightly more popular and more valuable at market than regular onions (we had a couple of requests for them). They’re also very exciting to slice open.

**Leeks**: Tadorna- While our leeks did well, we planted them on top of a bed, and they therefore didn’t get well blanched. We tried to put some compost around them but it couldn’t really be piled high enough. We recommend digging a trench to plant future leeks, and adding soil around them as they grow, in order to blanch them better. Otherwise, they grew well, sold well at market, and were very tasty.

**Scallions**: White spear- Our scallions did well and consistently sold at market. We did several plantings both in Tortilla Flat and in the Pioneer Beds. Early in the season, we came across some scallions that came up from last year, and harvested them to sell during our first few markets. Some scallions that were planted in the BMP grew fatter than our leeks!

**Garlic**: Dilmun, ordered variety German White- The garlic was planted by last year’s managers in the fall, and was nicely mulched with straw. We found that by the middle of the summer, however, the straw had broken down and allowed a nice stand of thistle to establish which are not fun to pull out. We would recommend adding more straw early in summer before weeds can germinate. Sometime in June, we harvested the scapes and brought them to market, though they weren’t particularly popular. With some better marketing, though, they have great potential. The bulbs were harvested around the end of July and sold at markets thereafter. The garlic that had been saved from previous managers was amazing, with large bulbs and great flavor. The other variety was not as impressive. The
garlic we planted with volunteers for next season is mostly Dilmun garlic, but there are also some cloves (German White) interplanted that we ordered to supplement our seed supply. These were planted in the BMP beds and mulched with straw.

**Solanaceae**

This family tends to be a favorite of customers and growers alike. Though they require some work, they prove to be beautiful, delicious, and bestsellers at market. Despite this, we give the solanums the same amount of space as all the other families. We did our best this year to optimize the space in this section to produce lots and lots of tomatoes, eggplants, peppers, and potatoes. Beside all of them selling well at market, they also added a certain flare to the farm. Customers marveled at the purple potatoes, the hot peppers spiced up our market table, and the heirloom tomatoes made for a delicious tomato tasting at the field day.

**Heirloom Tomatoes:** Great White, Brandywine, Moskovitch, Cherokee Purple, Amish Paste, Evergreen- Many of these seeds were generously donated by Alex Traven’s parents nursery, and proved to be very successful. We had two full rows of tomatoes that we transplanted in early May into black plastic. Tomatoes should be planted very deeply, as they send adventitious roots out of the stem. For trellising, we set up a series of posts along the rows and strung high tensile wire along them. Strings were then tied from each tomato plant up to the wire to provide support. This would have been a very tedious job for the managers, but with the help of willing volunteers we did it in one work party. As the plants grew we re-tied them to give them better support, but we found that we should have tied them at least once more. As the fruits grew they weighed down the plants into the rows or sometimes on the ground, making them harder to harvest and more susceptible to rotting and disease. The system could also have benefited from more frequent posts to spread out the weight of the plants. Once the plants are trellised, it is also important to keep them pruned. As a general rule of thumb for most varieties, a plant can only really support 2 or 3 main branches, and small shoots from the bottom of the plants are best removed. It is good practice to try to keep the center of the plant free of senescent plant material as well. Diseases are a serious concern for tomatoes, so always be on the lookout for leaf spots, necrotic tissue, wilting, leaf-curling, and any other tell-tale symptoms of the plethora of diseases that can affect tomatoes. As cases of late blight began popping up around Ithaca this past season, an extension agent made a visit to Dilmun to look out for disease. He found that we did not have late blight, but we did have some Septoria. As an organic farm, the best way to manage tomato diseases is with a hefty dose of prevention. The black plastic was helpful not only because it kept weeds down, but because it kept the plants from direct contact with the soil and prevented soil splashing. Maintaining good airflow is also vital, as moist stagnant air creates ideal conditions for fungal diseases. This
means having an effective trellising system where the plants are up off the ground and not too close together. At markets, the heirloom tomatoes made a beautiful display, and generally sold well. We had a few negative comments throughout the season based on the look of the fruits, but it was mainly due to a lack of knowledge of heirloom varieties. Halfway through the tomato season, we invested in a scale to aid in selling the tomatoes. We were then able to sell them based on weight instead of trying to eyeball a price for each tomato.

**Hybrid Tomatoes:** New Girl F1 - New Girl F1 - We grew only about ⅓ row of this variety, a new hybrid that is an improvement on their “Early Girl” variety. It performed as expected and produced sturdy typical red slicing tomatoes, of which sold well at market as well as to Manndible. While the taste leaves a lot to be desired compared to most heirloom varieties, these tomatoes brought in a bit of money and were generally a lot easier to grow and deal with in the field. We would recommend planting many more of these than we did, as Manndible could have bought much more than we had to offer. They were also slightly more popular at market, despite its obvious inferiority.

**Cherry Tomatoes:** Black Cherry, Sungold - Cherry tomatoes have awesome selling power because they are one of the few things we grow that someone can purchase to eat immediately. We never had trouble selling out of $3.50 pints. The Black cherries have a mild, sweet flavor and were perfect for mid-day snacking. Sungold has a more intense sweet flavor and is sure to satisfy anyone’s sweet tooth. We often sold mixed pints or quarts of the two varieties that easily caught the eye of the customers.

**Tomatillos:** We had about 15 tomatillo plants that we stuck in the end of the eggplant row under black plastic. Although they took a very long time to mature, we eventually had a nice harvest of these delicious fruits. We found them delicious both fresh and roasted in salsas, stir fries, and sauces. They did not sell particularly well at market, but volunteers loved taking them after work parties.

**Eggplant:** Black Beauty, Listada de Ghandia - We did half a row of each of these heirloom eggplant varieties under black plastic. The Listada de Ghandia eggplants produced fairly well but the eggplants were always quite small. Regardless, these did sell at market. Later in the season, however, they developed a strange problem where they were splitting. We had no idea what was causing this, since the most obvious explanation would be heavy sudden rain, but we had them under black plastic. It is possible that they had a disease or were reacting to the extreme weather conditions. The Black Beauty eggplants were slow getting started and didn’t produce very many fruits over the season. We sold a few of these eggplants, which generally got only slightly larger than the Listada de Gandias. However, both varieties are beautiful and really add something to the market stand.

**Sweet Peppers:** California Gold Wonder, King of the North, Corno di Toro - We had about half a row of sweet pepper on the Tortilla Flat as well as a full bed in the BMP. King of the North peppers were on the Tortilla Flat, which did very well although most of them were picked as green peppers instead of letting them mature into red bell peppers. In the BMP were 2 rows
each of Corno di Toros and California Golden Wonders. These were planted a bit later, and so never really saw the colorful, mature fruits. We were able to harvest many green peppers for the fall markets and pile them high on the table. We were a bit surprised by their lack of popularity but we were just as happy to give them to eager volunteers at the work parties following market. The only thing we might have done differently is plant them a bit earlier. Especially with the peppers in the BMP, we only harvested for a few weeks before they got hit with an hard frost (mid-October). We ended up pulling out tons of pepper plants covered with fruit and dooming them to the compost pile.

**Hot Peppers:** Basket of Fire, Early Jalapeno, Jalapeno Gigante, Habanero, Kung Pao Hybrid, Poblano, Anaheim chili - The hot peppers proved to be an experiment of spicy proportions. We received a few seeds of many different types of hot peppers from Peace Tree Farm, and were eager to find out just how spicy they could be. It turned out that they were not very spicy at all. Although there were varietal differences, overall nothing was as spicy as we expected. The season seemed to be perfect for this crop, hot, sunny, and dry. We had them planted in black plastic with an irrigation line, which we often kept on because they shared a row with the sweet peppers. Keeping them drier probably would have resulted in spicier peppers. At market, we would get a few eager customers to buy hot peppers, but overall they were not a tremendous asset to the table. One market, we tried to revamp our marketing strategy by setting up a “create-your-own pint of hot peppers,” with several piles of different kinds of hot peppers but it did not seem to help much. Sebastian, the owner of Mexeo, consistently sought out our hot peppers at work parties so there is potential that he may want to buy them in the future.

**Potatoes:** Magic Molly, Eva, Adirondack Red, many more - Various kinds of potato seeds were donated to Dilmun by the potato breeding program at the beginning of the season, which we were very excited about. We acquired 12 different varieties, which we planted in a row on the tortilla flat. They did surprisingly well, considering the heavy clay soil that they were planted in. They were also fairly popular at the market stand, especially the more colorful and exotic varieties.

**Miscellanaceae**

**Apiaceae**

**Fennel:** Zefa Fino - We had more fennel than we could handle (less than a third of a row). We probably managed to sell 3 or 4 fennel bulbs at each market to which we brought them, but we couldn’t keep up with them before they bolted. However, the fennel was pretty tasty so we do recommend planting some. It might be beneficial to try planning it so that they are ready in the fall rather than in the heat of the summer, to try to prevent the bolting.

**Carrots:** These were not a huge crop for us this year, due to the difficulty of growing them in the tortilla flat. The heavy clay soils are not conducive to root crops so we didn’t even try to seed any there. We did however, have some in the BMP but they were pretty sparse and we never
had enough at once to bring to market. They were very disfigured because of groundhog damage, which included the groundhogs chopping on the carrot greens every week or so. Later in the season, we had some carrots in the pioneer garden, but again, they were pretty sparse and mostly just eaten by the managers. We would recommend experimenting with seeding carrots in a heavily composted bed next year on the tortilla flat because they could be a pretty valuable crop.

**Parsnips:** Growing parsnips is essentially the same as growing carrots; they just take a good deal longer. Parsnips were seeded in one of the pioneer beds mid-summer by one of the kids groups that visited. They were somewhat sporadic due to poor germination and unfortunately they were eaten back to more or less stumps by browsing deer. This meant that they wound up pretty small, but overall they were of good quality. Next year, plant parsnips a month or two earlier, keep them protected from predation by deer and groundhogs, and don't harvest until late October and you should get a superb crop. Also, be sure to thin to about 2 inches between plants before the roots get too big.

**Parsley:** We planted 50 curly parsley plugs donated by Alex's parents’ greenhouse, Peace Tree Farm and it turned out to be a worthwhile crop. We planted them in one of the BMP beds, and early on they weren't looking too good, but they quickly made a comeback and grew vigorously throughout the season. We always had parsley to bring to market or give to volunteers. A limited planting of parsley like this is certainly worthwhile and provides some good experience working with herbs. Note that there are several weeds in same plant family that look very similar to parsley, and some of these are actually poisonous, so be careful when harvesting to not include any weeds.

**Dill:** We had only about 6 or 7 dill plants in an herb bed in the pioneer garden, and were able to sell a few bunches at market before they bolted. We then used the flowers to spruce up our market stand bouquets. If you also had a good crop of cucumbers, selling dill flowers and leaves could be quite lucrative.

**Celery:** Tango- We had an entire row of celery that did very well. The plants grew huge and we were able to consistently bring celery to market for a few months. We would recommend bunching celery stalks to sell instead of trying to sell the whole plant, if they are very big. People were overwhelmed by the humongous plants and we sold much more once we started breaking them up into bunches (and it was also more cost effective!). The celery tends to get wilty so we suggest keeping it in water at market if possible. Also, a whole row was probably more than enough as we still had some left over at the end of the season.

**Cilantro:** Despite past years’ failures with trying to grow cilantro, we were determined to make it work. We decided to try to find a bolt-resistant variety to plant to try to extend the growing time through the summer. We transplanting plugs into an herb bed in the pioneer garden, but found that they still bolted fairly quickly. Last year, the managers planted some cilantro in a bed in the tortilla flat, and harvested the mature coriander seeds. Some of these must've been left in the soil, because towards the end of the summer we had cilantro growing in the bed next to our
tomatoes. It did well, especially after the temperatures dropped in the fall and we got a few heavy rains. We ended up harvesting a bit for ourselves. Then we chisel plowed Tortilla Flat in October so the plants were killed and seeds were buried. For next year, we would recommend seeding or transplanting cilantro later in the season to take advantage of the fall weather. Cilantro could be a very popular crop and a lot of customers ask for it specifically.

**Asteraceae**

**Head Lettuce**: Black Seeded Simpson, Winter Density Romaine, Red Butterhead- Early in the season we seeded flats of winter density lettuce, which we transplanted to the BMP and harvested in time for the first summer markets. It worked out really well because they loved the spring weather and sold well at market. However, the only thing we would’ve done differently is spaced out the seeding to that we would’ve had a consistent 6-8 heads every week for a month or so. Instead, we had about 50 heads that were all ready to harvest within 2 weeks. There is not much flexibility because soon after the heads are ready to harvest, they start to bolt and become bitter. We took many to market, gave some to volunteers, and also brought some down to loaves and fishes. Later in the season, about July, we transplanted Red Butterheads into a Tortilla Flat bed. These did surprisingly well despite the heat and drought. We made sure to give them plenty of irrigation, and harvested them for market throughout August.

**Sunflowers**: Royal Hybrid and Firecracker- Sunflowers are a great asset to the market garden, even just for aesthetic purposes. We transplanted a bunch of sunflowers with volunteers in a small patch near the cucurbits, as well as a whole row in the market garden closest to rt 366. They really added a nice touch to the market garden, especially with all the tours and visitors coming through. The firecrackers were surprisingly nice because they produce multiple orange/yellow/reddish heads that are nice to mix up the standard big, yellow heads. Our plan was to harvest all the seeds to eat or press into oil. However, with the busyness of the end of the summer and start of the semester, most of the sunflowers near the cucurbits were forgotten and the seeds either fell off the heads or were eaten by animals (note: there may be a pre-seeded sunflower patch there next year). The royal hybrids planted by the road were planted a bit later so we were still able to salvage some seeds from those heads. Many of the seeds were very small, or there were no shells at all in the shells. Despite the disappointing seed results, the sunflowers were still a success and a pleasure to have in the market garden.

**Okra**: Millionaire or Green Fingers- The okra we planted was from seed leftover from last year, so we weren’t exactly sure the variety. We had maybe 15 plants that were somewhat hidden among the shiso and fennel in the miscellaneous section. Honestly, we often forgot we even
had okra, but when we did bring it to market it sold somewhat well. There was one consistent customer that always bought okra when we had it, but other than that most people weren’t interested (nor were we!). We would still recommend growing it because it is unusual and different from the normal repertoire of vegetables, but we would also warn against planting too much and getting stuck with tons of leftover market okra. Also, be sure to harvest when the pods are somewhat small and still tender, as they tend to get woody fairly quickly.

**Perennial Crops**

**Paw-Paws**: Dilmun has a well-established stand of productive paw-paw trees that are an awesome resource. This year, like last, we engaged volunteers in the spring by doing a hand-pollination activity. This basically involved taking small paint-brushes and shot-glasses, gathering pollen from a male-stage flower one tree, and moving it to a female-stage flower of another tree. There are lots of online resources that can show tell you more about the biology of paw-paw flowers and provide visuals for what a flower looks like in the female stage as opposed to the male stage. Keep in mind though that paw-paws tend to be self-incompatible, so crossing trees is essential for good pollination. Unfortunately, an early warm snap in March followed by frost killed many blossoms on the paw-paws, apples, and hardy kiwis. We ate the few fruits that did set, shared them with others, but didn’t have enough to sell this year. However, last year they got a great crop of paw-paws which were very popular, so we do recommend continuing to care for and pollinate the trees. Currently many of the trees are suckering and growing into more of a thicket, as they have a tendency to do in the wild. A management decision should be made as to whether we would rather have a more natural thicket like stand, or a more conventional orchard stand of single trees.

**Blueberries**: We applied more sulfur to the blueberry bushes on the swales, and there is more sulfur in the barn. We did not sulfur the plants in the OMG (old market garden), so this would be a good thing to do in the future. In addition, the blueberries in the old market garden need to be cleared at some point over the summer so that they are easier to access when picking. This involved scything the thicket around the bushes and possibly a path for better access.

**Strawberries**: Temptation and Galore Rose- in an attempt to bring the swales back into perennial production, last year the managers planted about 150 strawberry plants donated by Alex’s parents at Peace Tree Farm. Both varieties are geared towards horticultural production, rather than field production, so they may not be quite as productive. Both varieties are day neutral, meaning they will flower and fruit all season. One of the varieties has unique deep-pink flowers (rather than the usual white). This year the plants put out some fruit early in the summer, but it quickly turned very hot and dry so the plants went somewhat dormant. Again in the fall, they produced delicious red fruits that the managers and volunteers enjoyed.
Projects:
Dilmun has been trying to develop long-term projects. These are perhaps the most challenging as well as the most rewarding sorts of projects we can work on. They require collaboration between generations, encouraging continuity and developing farm infrastructure. The projects this year have been numerous, including the beginnings of a hoop house, the renovation of the rainwater catchment system and the development of a permanent raised bed system.

Hoop-House: In the beginning of the season, we came across an old, long-forgotten greenhouse kit that appeared to have every component needed to build a 12’x16’ hoop house. We began the construction in the fall of that season, and we finished the plywood ends in November. The hoop house now needs to be put in the ground. It is very important to remove the plastic sheeting, if not the whole structure before the snow begins to fall as to reduce stress on the structure. The instructions for disassembling the greenhouse are located in the manager docs in the Dilmun Google drive.

Rainwater-catchment irrigation: Another project we started this season was redoing the rainwater system, which consisted of one 55 gallon drum hooked to the front gutter without a filter, running to a sink. This system got repeated clogged with all the debris from the roof, and had exceptionally low pressure at the sink due to the small height difference. The system we are hoping to implement will capture the rainwater from the roof of the barn and provide a significant amount of water needed on the farm. It will hopefully provide enough water to wash hands and
vegetables, and help irrigate the Pioneer Gardens depending on the amount of rainfall. The roof of the barn is large and convoluted, however, all the rainwater seems to run to either the back center of the barn or the front left. Therefore we can use the back for drip irrigation on the Pioneer beds, and the front for hand and vegetable washing. There is an excellent source of 55 gallon plastic drums in the Cornell recycling center that should definitely be utilized for this project.

**Permanent Raised Beds:** One of the largest projects we have been working on this year has been the development of the permanent raised bed system at Dilmun Hill. The point of making our beds permanent is to reduce compaction, increase soil tilth, increase organic matter and encourage healthy microorganism ecosystems. In the past, we have had huge problems with soil compaction, as a result of our heavy clay soils and the many volunteer feet that damage the structure. Last season the managers worked on reducing tillage and forming semi-permanent raised beds and these worked well, especially in areas that had been under cover crop the previous season. However, that system still involved tilling and breaking up the soil every season, and we want to create a more long-term and permanent solution to improve our soil. Another main reason we wanted to make permanent beds is due to the basic layout of the market garden area. It is on top of a steep slope, and the edges of the garden tend to start sloping down. We’ve had trouble with water pooling in certain areas that exacerbated the compaction issue, as well as leading to some erosion. We have developed a project starting next season that focuses on erosion control through soil structure improvement and better management of slopes. This project includes this no till system in the market garden, as well as a new permaculture garden on the slope leading up to the garden. We will build swales with more fruit trees and other perennial plants to make this unutilized area more productive, but in a way that not only preserves but improves the soil health.

We started the process of converting the market garden to no till permanent raised beds by chisel plowing all of Tortilla Flats. This is in an attempt to penetrate the plow pan made from years of using the moldboard plow. We have also been working on constructing a comprehensive plan for the beds. They will be contour beds, meaning they will run on the contour of the hill, decreasing erosion and maximizing water capture. Permanent beds will drastically increase weed populations because of the lack of tillage. This will be a major problem for the first few years, and requires nothing but constant hand weeding. However; if this is done well, the rewards are much fewer weeds due to the decrease in overall weed seeds in the soil. We plan to seed the paths between the beds with some sort of ground cover, and the beds themselves will always be kept covered with either a cover crop or a vegetable crop.