

Through my three years studying environmental science, I've noticed a few common threads that crop up between all the topics covered in different lectures and classes. One such thread is the concept of a carbon footprint, as it pertains to global warming. Many professors I've studied with have demonstrated various internet calculators where it's possible to enter specific information about your living habits (such as how often you drive your car, how often you eat meat, or how many pairs of blue jeans you own) and in the end it gives you either a value (such as pounds of CO<sub>2</sub> released into the atmosphere per year based on how you live) or my favorite, how many planets would be necessary to maintain the level of consumption if every person was exactly like the user. This information always turns out to be shocking (I myself, even with being a vegetarian and riding my bike as much as I use my car, would require as much as 3 planets...I guess it would help if I wasn't so fond of shopping) but it does little to suggest how, specifically, calculator X found out how many pounds of CO<sub>2</sub> are released based on the user's activities. The more calculators and their subsequent values that I was exposed to, the more I started to wonder about this hidden fact, especially when it relates to food. Foods, as it is, has become a passion of mine in the past year as I simultaneously became a vegetarian (after sitting on the fence for several years before that) and have gotten into the heart of my degree, where the agriculture industry is a hotly debated topic in regard to the environmental degradation it has caused. As it stands, most consumers are unaware of how many processes go into putting our food on the shelves of our grocery stores; each process using that much more energy and adding more output (which would mostly be CO<sub>2</sub> and other greenhouse gases) to the equation. So, one curious consumer might be able to hop on the internet, Google a carbon footprint calculator for their last grocery bill, gasp at the pounds CO<sub>2</sub> per pound of product, and then continue on their merry consumption way without really knowing what to look for in order to lessen their negative impact on the environment through reducing their carbon footprint. Cue Sunseed Desert

Technology, Inc....an organization that I stumbled upon who is committed to making their impact on the environment as close to zero as possible by living off the grid, growing a lot of their own food, and practicing lot of other self-sustaining activities. I was intrigued, and decided there was no other way that I wanted to spend my summer then to volunteer at Sunseed and try to apply what I've learned in school and learn about a life more sustainable. While arranging my visit to the south of Spain to spend some time living in this eco-community, I expressed my interest in food, and over a few email exchanges it was decided that upon my arrival I could spend some time with the organic gardens department to brainstorm a project I could work on that would couple my interest in growing food more sustainably and spreading the word about the changes needed in the food industry.

Fast-forward one year when I finally arrived to Sunseed, I was able to see first-hand the principles Sunseed has regarding where they get their food, and realized what a good model Sunseed is for representing food consumption that is sustainable. This is mainly because they put great efforts into growing as much of their own food as possible in their 6 gardens on site, but are also conscious that there are some items that are needed both for a well-rounded diet and to simply meet the level of food needed to support the number of volunteers and staff members. This is remedied by a mix of participating in a local farmer's box scheme for supplying extra produce, and buying other products for the project from companies that are either local or committed to sustainable production processes, the goal being to have the smallest negative impact on the environment as possible. Sunseed recognizes that a lot of environmental degradation happens due to the current practices of our food economy, so the way they buy their food focuses on being as self-sustaining as possible but also supporting local food production when necessary. Additionally, Sunseed maintains a vegan/vegetarian-friendly diet because the very nature of these diets requires a lot less in the way of production; for example the average kilo of meat releases about \_\_\_\_

kilos of CO<sub>2</sub> into the air whereas the average fruit or vegetable produces only about 2 kilos of CO<sub>2</sub> per kilo of product produced.

That being said, this is not necessarily an argument for veganism, or even vegetarianism. While it obviously requires less input (and therefore less output into the environment) for one of these diets to be supplied overall, there are a lot of factors that go into calculating the “footprint” of an individual product...so much to the point that a conventionally produced onion, for example, grown with petroleum-based fertilizers and tractors, and then brought to five different locations to go through the inspection/packaging/distribution process before it even gets to the shelves on your grocery could very well have a higher footprint than a local organic farmer who only grass-feds his cattle and then brings the meat product to the local farmer’s market himself. It seems like a lot to think about though, when you’re at the grocery store trying to find the ingredients for a lasagna recipe, asking yourself whether or not to include meat since its most likely a product of some mass-scale industrial farm (even though it says it’s organic on the label, you can’t imagine such a large-scale company maintaining true organic standards like how you’d imagine), but then again where did this pasta come from? And the tomatoes! They were probably originally made in some plastic greenhouses in the middle of the desert in Spain and then had to go somewhere else to be chopped up and then another place to be put in cans and *then* shipped to the grocery distributor. Or maybe you don’t think about this at all when you go to the grocery store, and instead of sweating all over aisle 4 trying to pick between two brands of cheese, you’re back in your kitchen faster than you can say greenhouse gas emissions and are two hours away from a delicious homemade lasagna (the oven will cook out the chemicals in the pesticide used on the onions, right?). If you find yourself in this second group, you need to start thinking about where your food is coming from. Not as much as the other tormented soul however, who ended up just buying a head of organic lettuce and

eating a salad for dinner, because let's face it: it's impossible to completely eliminate all activities that create CO2 in our lives (maybe if you lived like Jake Gyllenhaal in Bubble Boy, but probably unfortunately less attractive...and even the production of his giant plastic hamster ball had some CO2 output). It *is* possible though to become conscious consumers; purveyors of the grocery who buy products that are sustainable for the environment...OUR environment, not just the one on nature shows but the one that we work, play, and live in every day, the one we need to protect and rebuild because of what we have stripped from it. As much as this is not a roast (pardon the pun) of people who consume meat, this is not a rip at the human race either. There have been amazing technologies developed, but in the wake of the excitement of a faster/cheaper/easier way to make product X, we forgot to think ahead of the consequences. At this point, these consequences are clearly visible (peak oil, for instance, or perhaps global warming) and it is up to the individual to recognize the facts, take it as seriously as the situation currently is, and do something about it. The action taken doesn't have to be as grand as a march on Washington, committing to buy sustainably produced food is just as effective.

But I digress...across the Atlantic and down to Sunseed, two people (that would be myself and Kirsty, who would be my mentor for the six weeks I'd be spending in the eco-community) sit outside under a bamboo covering chatting about the problem with the global food system and the problem of the uneducated consumers. Sure, it would be fantastic if every person could spend a few weeks of their life living off of the grid, growing their own food, and learning about sustainability but as it were, doing your business in a compost toilet all the while knowing that that shit will eventually become manure for the plants that you'll probably enjoy at dinner that night is not everybody's cup of tea. So how could we make it easier for consumers to be aware of what they're buying and what the effects they will make on the environment every single day? This is the moment when carbon footprints

conveniently came back into the picture, because as I've mentioned before, they basically summarize the amount of greenhouse gases (as much as the name suggests only calculating the amount of carbon dioxide involved, methane and nitrous oxide are just as guilty in the problem of global warming, and just as present in most aspects of production) released into the environment from the production of the product. A higher carbon footprint, besides being an indicator of how much GHGs are being released into the atmosphere, which is a known contributor to global warming, can indicate the presence of other steps during production that may include practices that cause other kinds of environmental degradation. The problem became, however, that most calculations were just estimates...not to mention the fact that in the end, it was just a single number associated with a product. It could have been just as easily been a cave drawing or a hieroglyphic as far as I'm concerned, because at first the number meant nothing to me. How did they get to that point? What calculations were actually involved in the process to get to that one number; did it include aspects in production as far back as obtaining the materials for the packaging, or the entire distribution process that would surely tack on a lot of CO<sub>2</sub> emissions because of all the transportation involved? It became very clear how caught up one could become in the calculation of one simple item, and that is speaking from personal experience of trying to find a starting point from where I could begin my project.

Luckily, I found a couple of groups of people who have made available not just a simple calculator, but also a whole website dedicated to the concept of a carbon footprint; what it is, how does it relate to the environment, and how you can reduce your footprint. They must have also anticipated the questions of environmental science students going abroad to create a food footprint for an eco-community, because among their many resources was a section that explained how they found made their calculations. One such website is [co2list.org](http://co2list.org), has a list of average footprints for different products which are broken into

different categories. They also have an Excel spreadsheet for each category and an explanation of how they got the footprint of a product. As you can imagine, I found this entirely useful, as I would be creating a similar document for Sunseed, except mainly only focusing on how it applies to food. As I've mentioned before, Sunseed is unique (compared to the average consumer, perhaps) in the fact that they try to grow as much of their own food as possible to both meet their nutritional needs and practice a low-carbon lifestyle. Due to the popularity of their project, however, they aren't able to meet all of the volunteer's needs (who probably all eat more than they would anyways because of how tasty the food is) all from their own gardens. This is where the local farmer's extra produce supply comes into play, as well as a combination of other regional produce bought from town and some dry, processed goods that are either bought from a grocery store in town or shipped in from a regional supplier.

Baring all of this in mind, I started to think how could I organize this information into a tool that could be used to pin-point carbon-happy foods and try to either cut back on or find a substitute for that item. Or they could also use the overall footprint to compare to the footprint of other departments at work at Sunseed (although those footprints are not yet created; that's another project for another summer) and strive for a completely carbon neutral community by being able to clearly see where to focus energy on carbon-offsetting activities, or set up carbon trading among the departments. Ideally, the footprint I wanted to create would make this information easily analyzed and outside of the applicability to Sunseed specifically, it would give me a better understanding of what goes into the complete production of an item and allow me to make more sustainable decisions as well as other people finding it easier to do the same. Phew! All that from one number, talk about sustainability and efficiency! So once more I sat down to talk with Kirsty, who gave me the run down of what we purchase, from where, how much, how often, why, who, etc. while as I listened and furiously took notes, I thought of how to organize what I've just been told. After discarding a few different grouping

schemes, I split all of the items into four groups; Sunseed gardens, local farmer, regional produce, and then finally processed products.

Figuring out the footprint of the items from Sunseed gardens was easy enough; those products were assumed to be carbon neutral because all of the inputs required for growing the produce came from either recycled or Sunseed-made materials (the compost, which I've eluded in a previous paragraph is a perfect example of this). There were other factors that I considered including in the calculations, such as the petrol it takes to (and subsequent carbon emissions of) drive to the beach to gather seaweed that is used as a moisture-retainer on the beds in most of the gardens. However, because of other things the gardeners practice that act as offsetting activities (like making their own compost, or planting legumes among other crops which are nitrogen-fixing sinks) it was safe to assume that the produce from Sunseed can be considered carbon-neutral. It was a similar situation for the produce bought from the local farmer, Jacki, however I wanted to distinguish between these two categories for two reasons. First, while Jacki is an organic farmer (meaning that there are no inputs to her system that come from synthetically-made materials), she is operating a slightly larger farm than the gardens at Sunseed and therefore requires the use of a tractor for some of production. However, this was not looked into further as a calculation for the same reasons that further detail was not added to the Sunseed produce. Also, once a week she drives to the village where Sunseed is located and delivers boxes of produce to those who are a part of her "box scheme". This means that there are extra carbon emissions to be calculated from the petrol used in driving to the village, which I found by multiplying the 5 kilometers distance from Jacki's farm to Los Molinos (the village where Sunseed is based) by the estimated carbon emission rating of a Fiat Scundo (the van that makes the trip), which I found on a used car information website. Adding this number, 0.56 kg CO<sub>2</sub>, to every item that Jacki brought gave me an estimate for the week, which I then multiplied by four to get an average for the

month. I should mention that the carbon emissions I calculated for the amount of petrol used to make the delivery could be assumed to be constant, as I suspect the farm and the village won't be moving further away from each other. The reason that the total carbon emissions from Jacki's produce are an estimate rather than a constant, however, is due to the fact that each week the amount of produce delivered varies. So while I could have calculated the kg of CO<sub>2</sub> per kg of each individual item, it would change every week. This same scenario is true of the produce bought from other regional providers, and just goes to show how varying a carbon footprint is, even if you're looking at the same source.

Anyways, the produce that came from Sunseed's gardens and Jacki's farm proved to be fairly easy to calculate, which I would be so bold as to translate to mean its obviously very sustainable because of the low carbon emissions values (I'll justify this by adding since it was easy, it means that there were less aspects of production that needed to be calculated, and less steps in production mean less emissions along the way). The produce that is purchased from Sorbas (the town in which the provider of all of the regionally produced produce resides) was a little trickier to sort through. The good news is that each week, a recording is made of what products are bought as well as their weight. The bad news is that there is no distinguishing between the produce bought from Sorbas and the produce brought from Jacki. This meant that for the week I chose to base the average footprint of produce off of was just that, an average, especially because it was also the week that we had almost a third more volunteers than usual and therefore needed to buy more food than usual. There were three things that I needed to know in order to have a more accurate estimate of the carbon that each individual item was accountable for; the emissions from the production, the emissions from the grower to the market, and the emissions from the market to our pantry. Because of the variety of produce that Sunseed buys every week (and the inability to find a pre-calculated estimate for very specific food products like pumpkins), I relied on the spreadsheet provided



by co2list.org to give me a starting point to calculation production emissions. As I mentioned before, they were gracious enough to make available a spreadsheet in which one could see how they calculated their estimates for a certain product. The food category, in particular, was further broken into the emissions for each major food group, of which the calculations for those were broken into percent of emissions from transportation and percent of emissions from production. The only group I was dealing with for the items bought from Sorbas fell into the “fruits and vegetables” group, which had a given estimate of 2 kg CO<sub>2</sub> per kg of fruit or veggie. Production accounts for about 75% of those 2 kg, so took 75% of 2 as my base value of 1.48 kg to then multiply to the weight of each product bought. For example, we bought 10kg of potatoes, so I multiplied this by 1.48 and 14.8 kg CO<sub>2</sub> was my production value. While I could have just tacked on the estimate that co2list.org gave for the amount of carbon emitted through transportation, it was simple for me to make it personalized for each item, so to speak, and in the end it would mean a more accurate footprint. I found an estimate for kg CO<sub>2</sub> emitted per km driven by an average size lorry (used for the delivery of the product from growers to suppliers) and multiplied this number by the kilometers between the city in which a product was grown and the town it was bought in (Sorbas). To use the example of the potatoes again, this value was 37.08 kg because they were grown in Grenada, which is 206 km away from Sorbas, multiplied by the average kg CO<sub>2</sub> emitted per km driven. Finally, added uniformly to every item bought from town, was 2.6 kg CO<sub>2</sub> emitted from the total 14 km drive to and from Sorbas to Los Molinos, which I calculated the same way I found the kg CO<sub>2</sub> from Jacki’s weekly trip. The total kg CO<sub>2</sub> calculated from all of these items was again added up and multiplied by four to get the average for the month.

The final section that needed to be looked at was the processed foods. This includes things like sugar, salt, flour, rice, and oil. Some of these things are bought in Sorbas at the same time we get extra produce, but the majority of dry goods are purchased from a

company in Murcia, which is 166 km away. The company, Rincón del Segura, grows, processes, packages, and distributes all of their own food except a few specific items that are grown with other ecological partner companies. The process I used to calculate for these items was quite similar to what I went through for the produce from Sorbas, except for a few exceptions. For example, for items like sugar, oil, and vinegar, which are not bought on a weekly basis, their monthly multiplier was applied individually and then added all together. The base value that was used for the production part of the calculation was found the same way as the produce, but since I wasn't looking at fruits and vegetables anymore, I had to decide which other food group a product would best fit in. For rice, lentils, chickpeas, both types of flour, and spelt I used the estimate from the grains group which produced a value of 2.18 kg CO<sub>2</sub> per kg of the product. Similarly, for the sugar, salt, olive oil, sunflower oil, and vinegar I used the estimate from the oils, sweets, condiments group that produced a value of 1.3 kg CO<sub>2</sub> per kg of the product. The biggest set back to this method became blatantly obvious in this particular set of calculations, because it's apparent that the production and inputs of the products in this last group are very diverse, so I would classify the final value for the oils, sweets, condiments group as a rough estimate at the very most. As far as the transportation values, I again used the same method as before, by multiplying the kg CO<sub>2</sub> emitted per km by an average lorry by the kilometers between the supplier and the seller. For most products, this value was 29.88 kg CO<sub>2</sub> because the company that supplied them was in Murcia, which is 166 km away. Rincón also has a delivery service for the products that they sell, so the usual addition of CO<sub>2</sub> from the trip to town is omitted from these products. There were also products, as I mentioned, that were sold through Rincón del Segura but not necessarily grown/processed there like the others, so an additional calculation was needed. The sugar as it were, turned out to be the product with the largest footprint because an ecological grower in Argentina supplied it, and it was also the only product that I looked at

that didn't come from Spain. Other products that didn't come from Rincón del Segura but still needed their own calculations for transportation were the olive oil, sunflower seed oil, salt, and vinegar. And the final step, as always, adding up each of the products to sum to a number that represents the carbon footprint of that category for a month on average.

So that was that! After pages and pages of random notes and calculations, and hours researching on the Internet I had it; a complete carbon footprint of the food consumed at Sunseed, a FOODprint if you will. I couldn't stop flipping through the pages of my amateur Excel spreadsheet (I don't think I'll ever understand how to really harness the full power of that program...don't tell my future employer) to bask in the glory of these numbers. Wait, did I say numbers? The very numbers, the singular values that represented the carbon footprint of an item that I had been confused about since the very beginning of this process? I suddenly became nervous that I hadn't really made any ground-breaking contribution to this eco-community which I had so boldly (and yes, naively) set out to do. At the end of the day, what would these numbers and totals mean to anyone else who wasn't involved in the whole process? I needed to think back to when I first had when I set out on this quest of creating a readable, applicable carbon footprint and remember the questions I had.

I think the most frustrating part of the conventional carbon footprint was that it was basically just a number without a frame of reference or context. So yes, I could find out that I emitted X amount of carbon in my life, or in the case of the Sunseed foodprint I had just created, they could be told how much carbon is emitted per month from their food consumption, but what are they going to do about it? I think that's where the break-down of the food categories and individual items come in handy. They're then able to see which areas may be able to be improved on, or even which individual items could be cut out. To give an example, mushrooms fall in the category of regional produce bought from Sorbas, which if you can recall is the category of produce that created the most carbon emissions, so every

time that Sunseed purchases mushrooms, they're adding to that value. However, mushrooms have been grown on site before successfully and after seeing the physical contribution the mushrooms have to the overall foodprint, I hope there is a bigger push to reinstate the mushroom grow house (as I write this, a fellow volunteer is trying to gather his troops to make that happen, maybe before the end of the summer). Another solution regarding individual items can be demonstrated with the case of the sugar. Although it is grown on an ecological plantation in Argentina, it has to be shipped all the way across the Atlantic to reach our little community. Obviously air travel hikes up a carbon footprint quite high, so it would greatly reduce Sunseed's footprint to eliminate this from the pantry, maybe by taking advantage of the south Spanish desert's natural flora, the agave plant, which produces nectar that some claim is almost sweeter than sugar. This is what I imagined when I thought of using a carbon footprint as a tool; not just looking at the number associated with a product but using it to implement change in your life. The footprint I created is by no means complete or final. It would be a good idea to keep track of weekly purchases in a systematic way, so that the foodprint could be added on to or updated periodically. In this way, Sunseed could more easily keep track of their progress towards a carbon-neutral lifestyle. Another use I could see for this tool is the ability to compare it to other departments at work at Sunseed, which could be used as a base for not only tracking the overall carbon-neutrality of the project, but perhaps a system of carbon trading could be set up.

Besides these suggestions, there is not a whole lot that Sunseed really needs to improve on in the way of consumption habits. In fact, their footprint reveals a lot about how to have a low carbon footprint without depriving yourself of a lot of nutrition (or taste! I would hire a Sunseed staff member to cook delicious vegan meals for me if I could), and as far as applicability to the outside world, one close look at their footprint proves to be a successful model for the consumer. For starters, the majority of the products are plant-based, which

always has a lower emission rating than if you included meat products in the mix. Additionally, all of the produce that is purchased is not only local or regional (supposing that they don't grow it themselves), but in season. Taking a look at the food print appendix reveals the advantages of supporting local or regional produce (less emissions from transportation), but buying produce that is in season is also important. In this way, you don't have to rely on the product to be shipped from all corners of the world to reach you (maybe in the middle of winter when you're dying for a banana to slice on your oatmeal, but it's just not gonna happen without a lot of effort and carbon emission). The bottom line is to be aware of the food you're eating;

It's very encouraging to live in a setting where food sustainability is a priority and you're forced (I say forced only because there was no other choice, but I can't recall anyone complaining about picking a few courgettes from the garden and popping up to the kitchen to cut it up and add it to some curry dish) to live it everyday. Although I had already be conscious of my consumption habits going into this project, I still learned a lot about what more I could do to eat sustainably without depriving myself. Even if you're still thinking to yourself that there's no veggie dish in the world that could substitute for a good lamb shank, Sunseed is still a good model to follow. It's about awareness more than depravation, and valuing your body and the environment more than a cheap over-processed hamburger that I myself attempted to be a vegan during my time here, and I use attempted very loosely because I was constantly craving cheese or ice cream. I don't think that I'll be giving up dairy products anytime in the near future, but I have taken away the knowledge that I can eat less of these products and still be happy without feeling deprived. I'll also be more aware of where I buy these products, committing to local cheese if available and at the very least, organic products. Our lives, after all, rely on food to keep us going so there's no use being miserable or guilty every time we have to feed ourselves. Making food more of a passion, to really think

about what you're than just a necessity will not only make you enjoy the sustenance of all of our lives but also contribute to sustaining a better world for all of us.