

Sustainable Chocolate: Seedling to Bar

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SUMMARY

The purpose and goals of this sabbatical experience was to immerse myself into an in-depth exploration of chocolate. Chocolate is one of the largest traded commodities, surpassed only by coffee, in global importance. As well, the historical impact of chocolate on societies is well documented, in ancient as well as modern times.

The sabbatical allowed me to understand chocolate from its inception as a seedling plant through the development of its fruit, harvesting of the fruit, processing of the “bean”, and development of the “bean” into an edible chocolate food. The sabbatical allowed me to witness and partake in this process in Belize, as part of the growing sustainable, organic, and indigenous farmer-led cacao industry. Led by these indigenous farmers, in the form of co-operatives, Belize has embraced the ecologically supportive and sustainable practices required to make cacao a generational commodity for their communities and their country. The intent of the Belizean farmers is to grow the Belizean cacao industry into a valued, long-term, sustainable cash crop (cacao beans), with the additional side-industries of spice farming, eco-tourism (plantation tours), and exportable finished food products in the form of finished eating chocolate, secondary chocolate products, and culinary spices.

My interest was with the full cycle of cacao - how the farmers begin their crops, decide where and how to plant the seedlings, care for the seedlings to maturity, harvesting of the fruit, and then processing of the cacao beans – all within a co-operative, sustainable, and eco-friendly manner. The majority of cacao farmers of Belize are committed to achieving and maintaining the International Standards for Certified Organic and Sustainably Harvested chocolate in order for their product to attract world attention and to attain the highest world-commodity price as possible for their cacao. All of this effort is to maintain the integrity of their ecosystem and become a world-model for Fair Trade, organic and sustainable cacao.

I spent the final part of the sabbatical visiting and working with an artisan cacao processor, or *atelier*, in order to explore the transformation of the local cacao bean into a quality eating chocolate, in a small production facility.

The PROJECT

From the beginning of the project, the cacao farm owners of now-defunct Toledo District Cacao Growers Association were clear that cacao fruit ripening was 5 -7 weeks behind normal. Although cacao fruit grows and ripens year-round, the bulk of harvesting typically begins in early-to-mid February. But for reasons unclear to the farmers, only light harvesting was taking place, and only on a few cacao farms. This phenomenon altered my sabbatical plan. All processes were pushed back until the cacao began to enter into its main ripening and harvest time.

I spent the majority of my time in Southern Belize, in the Toledo District, at Che’Il chocolate farm and Ixcacao Chocolate with Juan and Abelina Cho. It was here at Ixcacao that I participated in the bulk of my experience.

The overall approach to farming that is employed at Ixcacao farms can be linked to the biodynamic philosophy of farming. All plants are integrated into the farming landscape, and nothing is wasted. If a product cannot be consumed by people or animals, it is composted and returned to the land.

The ideas of Western farming practices are not evident here. There are no clearly defined rows. There is no crop segregation. All products grown on the farm are thoughtfully planned, planted, and cared for within a cooperative mindset. Every three cacao trees are near a *Madre de Cacao* tree – the Mother of Cacao – a tree that provides nitrogen and shade to the cacao trees and provides natural insect repellent properties, keeping pests away from the emerging and ripening cacao pods.



Sustainable Farming Practices



Monoculture practice

Seedling Propagation

As with most plants, a seed is planted in nutrient-balanced medium and the seed germinates and begins the life of a new plant. So, with cacao trees. Since harvest time was delayed this year, seed propagation was also behind schedule.

I spent the first 10 days working the compost piles, blending and sifting soils, and preparing the seedling containers. We were seeking a soil pH of 6.0 and high nutrient availability. All compostable materials that are present on the farm become part of the nutrient base for the cacao seedlings, as well as providing a nutrient supplement for the other farm products, such as the spice plants and sugar cane.

Monoculture seedling propagation results in a 93 – 95% germination rate with an overall 1-year survivability of 80% after transfer to the fields. The biodynamic approach yields a 94 – 96% germination rate, with a 1-year survivability of 99% post-transfer. Seedlings are planted once they attain the height of 14”.

Propagation is also done by creating grafts and clones, but this approach was outside of the methods employed during my visit.

Harvesting

Cacao pods ripen at differing rates and must be hand-picked in order to ensure correctly ripened pods. It is common for a single tree to be harvested continually over a 10-day period of time.

The harvesting itself is not 'hard' work; it is repetitive and requires miles of walking. Depending on the varietal of cacao, the pods will vary in color. From deep yellow with splashes of orange, to reds and purple colors. The key is to ensure the pods have the key sound – a hollow knock when tapped. The pods are removed from the trees using a machete, or a flat knife secured to a long pole, and carried in sacks to the fermenting bins. This is where the 'hard' work comes into the harvesting picture. Here, at or near the fermenting bins, the pods are split open and the cacao seeds ("beans") are removed. This is a critical juncture in cacao production – if the seeds are not properly ripened, then the cacao will have an increased bitterness and unfulfilling aromas. Over-ripe seeds can bring unpleasant musty aromas to the cacao.



Criollo

Trinitario

Forestero

The seeds are put into wooden bins, covered with banana leaves, and allowed to sit at ambient temperatures for up to 7 days. During this fermentation stage, the seeds are stirred several times a day. Excess moisture from pulp is allowed to drain away (it is often collected for a refreshing drink!). Four days into the fermentation stage, the seeds/beans are sampled 2 – 3 times a day for flavor development and assessed for colour development. This is where the emerging flavor profile of the chocolate begins to show. Once the correct amount of fermentation is deemed to have occurred, the beans are spread out to dry in the sun. The drying process stops fermentation but allows enzyme action on the cacao starches to continue to develop more complex chocolate flavor, until the beans are sufficiently dry for storage. Moisture content of fermented cacao beans is around 60%; the beans must be dried to below 9% moisture content with 7 – 7.5% moisture content being ideal, in order to allow the beans to be stored and to facilitate proper roasting of the beans.



Drying Cacao Seeds (Beans)

Once dried, the beans are now sorted, graded, and bagged for shipping, or are further processed into chocolate or chocolate products.

Processing

Dried cacao beans need to be roasted in order to create the classic aromatic profiles we associate with chocolate. Much like coffee roasting, the roasting of cacao beans requires a knowledge of the effects of heat on volatile organic compounds. The key changes to the cacao beans during roasting are:

1. Caramelization of sugars
2. Dextrinization and caramelization of starches
3. Final moisture loss
4. Breakdown of alkaloid (bitter) compounds

The extent to which the cacao will be roasted is defined by the producer of the final product. Each producer will attempt to control as much as the processing of the beans as possible. Fermentation timetables and standards, agitation and rest periods during fermentation, degree of drying and resulting moisture content, and the roasting process itself.

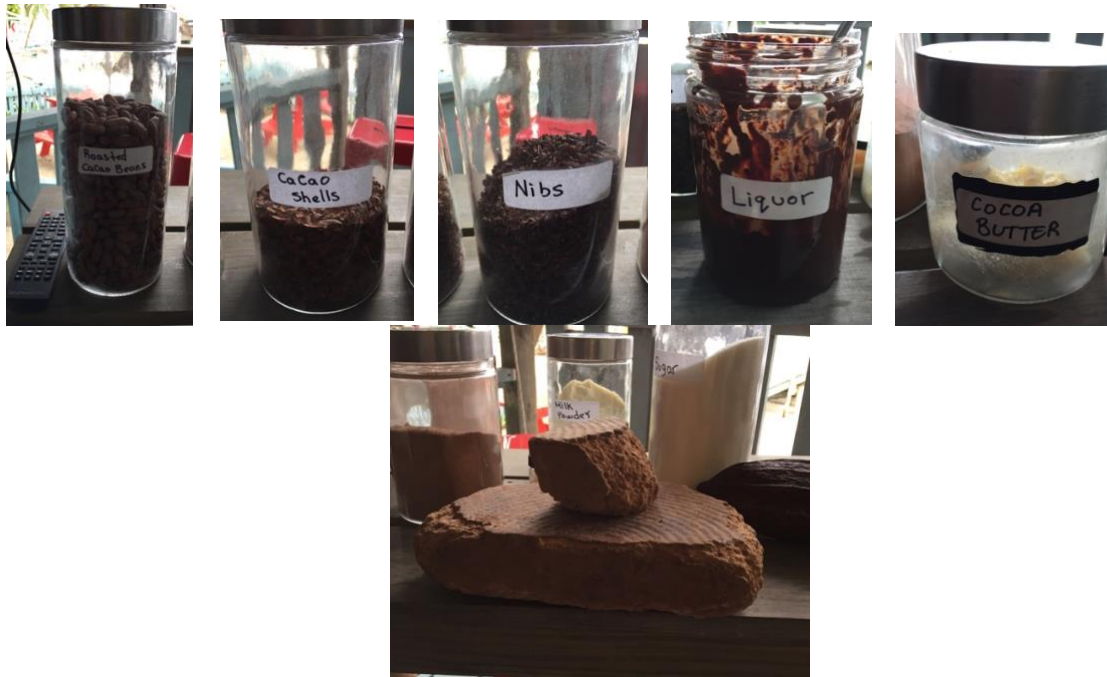
At the completion of roasting, the beans will have their exterior skin removed in a process called 'winnowing'. These skins are similar to the chaff comes off of coffee beans during the roasting process. Cacao skins must be removed through a process of light cracking and agitation with air flow. The resulting clean bean is now referred to as a 'cacao nib'. The nib is what is processed into chocolate products.

There are three major 'final' products derived from fully processed and roasted cacao beans:

- Chocolate mass (cocoa mass)
- Cocoa powder (starch)
- Cocoa butter (fat)

These products are achieved by the grinding of the cocoa nibs into a paste. Continual grinding will produce a finer and finer texture, giving the cocoa mass the appearance of a thick, molasses-like liquid. When the cocoa mass is pressed, the cocoa fat is forced out of the mass leaving cocoa powder in the form of a cake.

Cocoa mass is the base of all dark and milk chocolate. Into the cocoa mass other ingredients are commonly added – sugar, additional cocoa fat, additional cocoa powder, milk solids (for milk chocolate), and in some cases, an emulsifier (lecithin) and vanilla (either natural or artificial).



Chocolate is further refined through a process called ‘conching’. This is a term that refers to a long, fine grinding and mixing process at a temperature of approximately 120F (milk chocolate) to 180 F (dark chocolate). This process produces smaller particle size of the cocoa starches and sugars, and improves the distribution of fat. These two key changes are instrumental to the texture and melting qualities of modern chocolate. Other changes that occur are oxidative – the continual agitation of the conch machine ensures continual air exposure to the chocolate, which aids in moisture removal, an increase in acidic compounds, and a continual decrease of bitter alkaloids. The conching process allows for an even and thorough distribution of fat throughout the chocolate. Pastry chefs refer to this even fat distribution as a chocolate's *temper*. Properly tempered chocolate allows pastry professionals, bakers, and cooks to create chocolate art that will remain solid at temperatures up to 82 – 88 F. Melting will typically begin close to body temperature, around 92 F.



Small Conching Machine



Large Commercial Conching Machine

Final Steps – The Atelier

I concluded my sabbatical at a small artisan chocolate shop in the north of Belize. This part of the sabbatical was anti-climactic. There was a miscommunication regarding my earlier arrangements. The shop was only open 3 of the 10 days that I had allotted for this part of the study. The owner/operators had left one of their managers in charge during their absence but had failed to inform her of my work study arrangements. I was able to spend a few days in the shop, but there was minimal production happening at that time.

Here, the chocolatier takes the dried cacao beans and completes all of the required steps to produce eating chocolate. All ingredients from Belize – chocolate, sugar, milk powder, spices - the certified organic, fair trade/direct trade cacao from small family farms in Southern Belize, Belizean cane sugar from Northern Belize, milk powder from Central Belize, and various spices which are grown throughout Belize, to make their signature ‘Kakaw Belizean Chocolate’.

Still, it was wonderful to see the company’s approach and integration of local and sustainable practices – buying directly from the local farmers and utilizing 100% of the cacao product into:

- Cocoa powder
- Cocoa butter
- Eating chocolate
- Roasted cocoa husks for chocolate tea
- Use of cacao products in beauty aids.
- Reusable/recyclable containers and packaging



Tempering Dark Chocolate



Conching Milk Chocolate



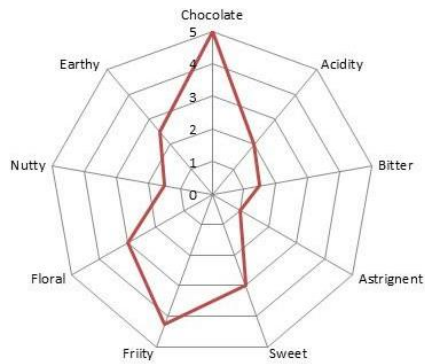
Unmolding Dark Chocolate



Unmolding White Chocolate



Belizian Eating Chocolate



Chocolate Tasting Profile



Individual Eating Chocolates

REFLECTION

The experience of this sabbatical project has been eye-opening. The ability to fully explain, from a personal experience perspective, to our program students is invaluable. Similar to the Perkins internships that I take full advantage of, the in-depth, hands-on learning and work within the industry allows me to relate to students on a deeper level; a level of shared experience of being the learner. The final week of the first year Culinary program is devoted to chocolate and this experience will allow me to bring a much richer dialogue to the topic. This sabbatical will also demonstrate to current students, new students, future students and the general public that the instructors of our program work at maintaining real-world industry connections and experiences, ensuring that the information and skills being presented in our classes is as current as it can be. It is important to me to ensure that our program is relevant to today's Culinary and Hospitality industries.

I am also in a position to offer support to the other instructional staff in our program by providing guest lecture opportunities to their classes, not only on the subject of the chocolate industry, but also on the ever-important processes that support a sustainable food system.

There was so much anecdotal information, knowledge and skills that I obtained from this sabbatical project. Experiencing being a minority within a work place environment, living in a community that exists well-below any poverty line that exists within North America, and the absolute importance of community cooperation to ensure the livelihood and success of every individual as well as the greater community. Positive structures of socialism established out of necessity, in order to survive and thrive, and to deal with the pressures of capitalism. It was an absolute joy to be in a community that shares my own personal and professional value of 'waste nothing, honour everything and everyone'.