Sweeteners

Sweeteners	Growth (Where)	Growth (How)	Harvest
Natural Sweeteners			
Coconut Sugar 	Coconut sugar is produced from palm trees that need hot, humid, tropical climates to grow. They do best in well-drained soil with lots of sun exposure.	Coconut sugar comes from the sap of coconut tree flower buds. These trees take about 5 to 7 years to produce flowers for sap. A coconut tree reaches full maturity and peak harvest around 15 years old and can produce sap for decades.	Coconut sugar begins with the process of harvesting sap from the flower buds on coconut trees. This is done by farmers who climb the trees and make precise cuts into the flowers buds to extract the sap. This process often takes place twice a day.
Corn Syrup 	Corn Syrup is produced from field corn. Field corn is grown mainly in the United States Midwest, also known as the "Corn Belt". Field corn grows best in warm, sunny climates with well-drained, fertile, and. deep soils.	Corn Syrup comes from breaking down the cornstarch found in the field corn. This starch is broken into simple sugars. Field corn is at full maturity within 100-130 days after planting.	Field corn is harvested using combines. These combines cut the corn stalks and separate the kernals from the cob. After being separated from the cob, the kernals are transported for milling.
Honey 	Honey is produced by honey bees and the nectar that they collect. Honey bees produce the most honey in areas with abundant and diverse nectar sources. Areas with plenty of sun, water, and protection also help improve honey production.	Honey is made when bees collect nectar from flowers, store it in a honey stomach, and enzymes convert it into simple sugars. Back at the hive, bees pass the nectar between them, reducing water content. It is then placed in honeycomb, further evaporated, and sealed with wax once it reaches the right consistency and color.	Honey is harvested by removing the wax caps from the honey comb. These caps can be removed with a hot knife or scratcher. The frames that contain the now uncapped honeycomb are spun in a centrifugal extractor, or can be crushed and strained to extract honey from the honeycomb.
Maple Syrup 	Maple syrup is made from maple tree sap. Maple trees produce sap best in continental climates with a spring freeze-thaw cycle, where nights fall below freezing and days rise above.	Maple trees produce sap that eventually becomes maple syrup. Sap is collected from trees that are at least 10 inches in diameter. Maples trees are usually about 40 years old when they reach a size mature enough for sap harvest.	Sap is harvested by drilling a hole into a maple tree, where sap is carried. A metal spile drains sap into a covered bucket, or a plastic spout connects to a pipeline system. The harvest season lasts 4–6 weeks, and each tap yields about 10 gallons of sap, producing about one quart of syrup.
Molasses 	Molasses is produced from refining sugarcane, and less frequently sugar beets, into sugar. Sugarcane grows best in tropical and subtropical climates with hot, sunny, and wet conditions. Sugar beets grow best in cool, temperate climates with warm sunny days and cool nights.	Sugarcane is used to make molasses. These plants take about 12 months to reach maturity for harvest.	Sugarcane is cut down by hand or by using a combine-style harvester. These stalks are cut at the base and the leaves are removed. It is immediatly transported to milling to preserve as much sugar content as possible.
Monk Fruit 	Monk fruit is grown in warm, humid, and high-altitude climates like Asia. They require a rich soil and consistent water.	Monk fruit is a perennial vine that requires high-temperature differences between day and night. This plant takes 6 to 8 months to reach maturity and relies on hand-pollination.	This plant is harvested by hand between the months of September and November. The fruit is delicate at harvest and can bruise easily. This requires careful handling and harvest techniques.

From Farm to You

Natural Sweeteners

Geography	Transport & Processing
Indonesia is the top producer of coconut sugar, followed by the Philippines and Thailand.	After harvesting, the coconut tree sap is filtered, boiled, and cooled to extract the sugar from the sap.This process turns the sap into a syrup that later crystalizes. It is then dried, sifted, and packaged. Once packaged, it is transported for sale.
The United States is the top producing country of corn syrup, followed by China and Brazil. The top field corn producing states are Iowa, Illinois, and Nebraska.	After harvesting, the corn kernels are softened in a water and sulfur dioxide tank, then ground to extract starch. This starch slurry is treated with enzymes to convert carbohydrates into glucose, which is transformed into high-fructose corn syrup. The syrup is filtered, purified, and excess water is evaporated. It is then transported in bulk containers, ready for mixing into foods and beverages or for sale.
China is the top producer of honey, followed by Turkey and Iran. The top producing states are North Dakota, South Dakota, and California.	After harvesting, honey can be consumed raw, or it can be further processed before consumption. It can be filtered/strained, pasteurized, and bottled/packaged. It is then transported for sale.
Canada is the top producing country of maple syrup, followed by the United States. The top producing states are Vermont, New York, and Maine.	After harvesting, the sap is filtered and poured into evaporators. It is then boiled to remove water and concentrate the sugar. The sap is boiled until it reaches a sugar density of about 66% and a temperature of 219 degrees Fahrenheit. It is filtered while hot, graded based on color and flavor, and bottled, still while hot, which creates a sterile seal. It is then transported for sale.
Brazil is the top producer of sugarcane and molasses, followed by India and Argentina. The top producing states are Florida, Louisiana, and Texas.	After harvesting, the sugarcane is shredded and crushed to extract the raw juice form the stalks. The liquid from the sugarcane is then purified and heated until is becomes a concentrated syrup. The syrup is spun in a centrifuge where the sugar crystals seperate from the syrup. The leftover liquid after the seperation is molasses. The more extractions that occur, the darker and less sweet the molasses will become.
China is the top producer of monk fruit, followed by Thailand.	After harvesting, the monk fruit is quickly transported and procesed due to easy spoilage. It is cleaned, crushed, and the juice is extracted using hot water. The extracted juice is filtered, dried, and often blended with additives. It is then packaged and shipped for sale.

Distributor

Raw and processed products are sold in bulk quantities to a buyer who will distribute it to a retail store.

Store

Retail product is sold to consumers.

Products Made with Sweeteners

Products	Nutrition
Natural Sweeteners	
Coconut sugar is used as white or brown sugar in sweets.  	Coconut sugar has a similar caloric value as white sugar, but contains lower values of glucose and fructose, and trace amounts of iron, zinc, calcium, and potassium.
Corn syrup is often used in processed foods, sodas, flavored drinks, breakfast foods, condiments, and desserts.    	Corn syrup has about 17 calories per teaspoon. It is a relatively high calorie food.
Honey can be eaten on its own, or added to foods and drinks to enhance the sweetness/ flavor. This includes smoothies, yogurt, and tea.   	Honey contains about 60 calories per tablespoon. It is a dense source of natural sugars, containing about 50% fructose and 50% glucose. It also contains antioxidants, vitamins, and minerals.
Maple syrup can be eaten on its own, or used as a sweetener in/on foods. This includes pancakes, granola, and baked goods.   	Maple syrup has about 54 calories per tablespoon. It is a natural source of vitamins and minerals such as riboflavin, thiamin, manganese, calcium, and potassium.
Molasses is used in baked goods, sauces, animal feeds.  	Molasses has about 58 calories per tablespoon. It has a high mineral content and is a natural source of iron, magnesium, and potassium.
Monk fruit is used as a white, golden, or brown sugar in sweets and drinks.   	Monk fruit is a zero-calorie, zero-sugar, and zero-fat sweetener. It contains some antioxidants and anti-inflammatory properties. It is often blended with fillers.

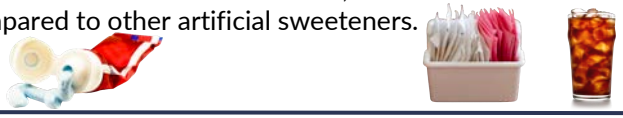
Sweeteners

Sweeteners	Growth (Where)	Growth (How)	Harvest
Natural Sweeteners			
Sugar Beets 	Sugar beets prefer to grow in well-drained soil, with consistent water supply, and long warm days.	Sugar beet seeds sprout in about a week and are vulnerable early on to weather. A leafy canopy forms above the soil while the beet grows underground as a root. As conditions change, the plant shifts energy to store sucrose in the root.	The leafy foliage is removed, or topped, in the autumn and the roots are harvested from the ground. This is often done in a 24-hour cold-weather operation to ensure the sugar content is preserved in the sugar beet.
Sugarcane 	Sugarcane is grown in tropical and subtropical regions around the world. It grows best in high-humidity, lots of water, and well-drained soil.	Sugarcane is a perennial grass that takes 12-24 months to mature. Plants are propogated from sugarcane cuttings. It is buried in furrows and can grow to be 10-20 feet tall.	It is harvested by cutting the stalk at the base. Those stalks are then cut into smaller pieces. This process can be completed either by hand or mechanically. Roots remain in the ground after harvest and continue to produce for future crops.
Stevia*  *although Stevia comes from a natural plant source, it is heavily processed like artificial sweeteners	Stevia thrives in warm and sunny climates. It does best in sandy, well-drained soil.	Stevia reaches maturity about 3 to 4 months after the seeds are planted. Seed germination can take anywhere from 7 to 21 days. It can be grown as a perennial in warmer climates, but is treated as an annual in colder climates.	Stevia leaves are sweetest in early autumn and just before the plant flowers. It is also recommended to harvest in the morning for even higher levels of sweetness. Leaves can be harvested individually or by cutting the plant back by half. This allows for the plant to regrow if in a warm climate.
Artificial Sweeteners			
Aspartame 	Aspartame is created in a lab from naturally occurring amino acids. The lab environment includes test tubes, seed tanks, fermentation tanks, centrifugal separators, crystalizing tanks, crystal separators, and filters.	Aspartame is created by chemically combining aspartic acid and phenylalanine, two naturally occurring amino acids. The amino acids are created through fermentation for the production of aspartame.	The amino acids are produced through bacterial fermentation, then isolated and purified. They are crystallized, dried, and mixed in a reactor at room temperature for 24 hours, followed by heating and cooling. The mixture is then diluted, filtered, and dried before being converted to aspartame through a reaction with acetic acid.
Saccharin 	Saccharin is created though chemical synthesis in a lab. This synthesis can occur through two different methods.	Saccharin is created through the oxidation of o-toluenesulfonamide or phthalic anhydride in the original process. In newer and large scale production methods, the process begins with methyl anthranilate.	Methyl anthranilate reacts with nitrous acid, sulfur dioxide, chlorine, and ammonia. These reactions produce saccharin acid which is then neutralized with sodium hydroxide. This creates the final product of sodium saccharin, the artificial sweetener.
Sucralose 	Sucralose is created in a lab by chlorinating sucrose.	Sucralose is created by replacing the three hydrogen oxygen groups in normal sugar (sucrose) with three chlorine atoms.	Sucralose begins with regular table sugar. Three hydrogen oxygen (hydroxyl) groups are then replaced with chlorine atoms. After which the compound is purified, crystalized, and filtered. The finished product is a crystalized powder.

From Farm to You

Geography	Transport & Processing	Distributor	Store
Natural Sweeteners			
Russia is the top producer of sugar beets, followed by France, Germany, and the United States. The top producing states are Minnesota, Idaho, and North Dakota.	After harvesting, sugar beets are transported to a factory where they are sliced into thin strips called cossettes, difussed to extract juice, filtered, and formed into a syrup. The syrup then forms sugar crystals and is separated in a centrifuge. The remaining crystals are then dried, packaged, and shipped for sale.	 Raw and processed products are sold in bulk quantities to a buyer who will distribute it to a retail store.	 Retail product is sold to consumers.
Brazil is thte top producer of sugarcane, followed by India and China. The top producing states are Flordia and Louisiana.	After harvesting, the sugarcane is transported to a mill. There it is cleaned, prepped, milled, clarified, boiled, and spun in a centrifuge to separate sugar crystals from the now molasses. It is then taken to a refinery to be washed, melted, and filtered to remove remaining impurities. It crystalizes again, is dried, and packaged for sale.		
China is the top producer of stevia, followed by India and Paraguay. The top producing states are North Carolina, Florida, and California.	After harvesting, the stevia leaves are separated from the stems, dried, and steeped in hot water. The liquid is then filtered and concentrated. Crystals then form, are separated, dried, milled, and often blended with bulking agents. Finally, the sugar is packaged and shipped for sale.		
Artificial Sweeteners			
China is the top producer of aspartame, followed by the United States and Japan. The top producing states are Georgia, New York, and Illinois.	After aspartame's 12 hour reaction period, it is dried, packaged into moisture proof containers or bags and shipped to food manufacturing facilities. It is generally shelf stable, but must be kept dry and in a controlled temperature. It is incorporated into foods and drinks at food manufacturing facilities, after-which it is distributed to stores for consumption.		
China is the top producer of saccharin, followed by India and South Korea. The top producing states are Texas, Indiana, and North Carolina.	Saccharin is filtered, crystalized, and dried into a consumable form. It is then packaged into polyethylene liner bags and then into a cardboard drum or bag. These drums/bags are transported in temperature and humidity controlled environments to prevent clumping, degradation, and maintain product stability.		
China is the top producer of stevia, followed by India and Paraguay. The top producing states are North Carolina, Florida, and California.	Sucralose is packaged under controlled temperatures and humidity. While it is a stable product, it is kept in cool, dry, and well-ventilated areas during transport to prevent degradation. It is sold in consumable portions as well as, already mixed into foods and drinks.		

Products Made with Sweeteners

Products	Nutrition
Natural Sweeteners	
Sugar beets are used as white sugar in sweets, a pulp in livestock feeds, road de-icing, and ethanol. 	The sugar beet itself is low in calories, but contains high amounts of sugar, fiber, and potassium, and includes nutrients such as folate, manganese, and Vitamin C. They also contain minerals like potassium, magnesium, and calcium.
Sugarcane is a diverse product that can be used as white, brown, and raw sugar in sweets. It is also used as a molasses, ethanol, and bagasse. 	Sugarcane is considered a high calorie food that contains minerals such as calcium, potassium, magnesium, iron, and phosphorus. It also contains small amounts of vitamins A, B, C, and E.
Stevia is used as a powder, extract, leaf, and white sugar in sweets and drinks. 	Stevia is a zero-calorie, zero-sugar per-serving food. It is often blended with fillers.
Artificial Sweeteners	
Aspartame is a chemically produced powder that is mixed into foods and drinks. 	Aspartame is a zero-calorie per serving food. It is 200 times sweeter than natural white sugar.
Saccharine used in products like chewing gum, toothpaste, some baked goods, and other drinks and food. Due to it's slightly metallic and bitter aftertaste, it is used less in sweets as compared to other artificial sweeteners. 	Saccharine is a zero-calorie per serving food. It is 200-700 time sweeter than natural white sugar.
Sucralose is a powder that is mixed into foods and drinks. It is the most frequently used artificial sweetener for baked goods. 	Sucralose is a zero-calorie per serving food. It is 600 times sweeter than natural white sugar.