

Pre-Feasibility Study Chocolate Industry

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It is important to mention that data in the sub-sectors of the agri-food industry is sometimes scarce largely due to the fact that a significant number of companies and individuals operate partly or fully in the informal sector.

PREFACE

As part of the United Nations' Productive Sectors Development Program (PSDP) in Lebanon that aims in supporting gender-responsive job creation and economic opportunities in the agri-food sectors, the United Nations Industrial Development Organization (UNIDO) is committed not only to reduce the gap in market intelligence for micro, small and medium enterprises (MSMEs) in the agri-food sector, but also to provide support to the Ministry of Industry in terms of institutional capacity.

As such, UNIDO, in cooperation with the Ministry of Industry, is drafting several product-specific pre-feasibility studies, which provide MSMEs in key value chains in the agri-food sector with information and insights, in order to help them improve their production process, make it more efficient and raise awareness on international standards that are required to export their products abroad. Through these reports, UNIDO also provides institutional support to the Ministry of Industry in finding and gathering data, and transforming it into actionable insights, so it can promote efficiently Lebanese agri-food products."

This report includes research insights and growth opportunities in the Chocolate industry within the Lebanese market, also focusing on its potential to become more competitive and prominent. Several consultations have been conducted with industry experts and major players in order to provide tangible product knowledge for Lebanese producers.

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The development of the pre-feasibility study report is a collaborative work between the United Nations Industrial Development Organization (UNIDO) and the Ministry of Industry (MoI) as part of its Productive Sectors Development Programme (PSDP). The PSDP is a UN joint programme, funded by the government of Canada and implemented by six UN agencies (UNIDO, UNDP, ILO, UNICEF, FAO & UN Women) and coordinated by the Resident Coordinator's Office (RCO). The report was drafted by Ms. Nour Mrad (Project Assistant, UNIDO), Mr. Elie El Khoury (Economist, UNIDO), Mr. Julian Barhoun (Senior Project Assistant, UNIDO), Ms. Lina Assi (Agri-Food Engineer, Head of Standards and Quality Inspection Department, MoI), Mr. Bassam Jouney (Economist, MoI). Oversight and coordination were done by Mr. Kjell Sundin (UNIDO Project Manager) and Ms. Nivine Chahni (Project Coordinator).

DEFINITION

Chocolate is a food product made from roasted and ground cacao pods, that is available as a liquid, solid or paste, on its own or as a flavoring agent in other foods. Cocoa production areas lie near the equator. This region of tropical rain-forests, with its moist, windless climate and constant warmth, provides ideal conditions for the growth and well-being of the cocoa tree. The cocoa tree is mostly planted in the following countries:

- Brazil
- Venezuela
- Mexico
- Ecuador
- Ivory Coast
- Nigeria
- Cameroon
- Malaysia



There are several species of cocoa trees. They are very delicate and sensitive plants, and need protection from wind and sun.

In fertile soil conditions and with intensive husbandry, cocoa trees can grow in full sunlight once they are established. Cocoa plantations and estates are usually located in valleys or coastal plains, and must have evenly distributed rainfall, and rich, well-drained soil.

The annual yield per tree is between 20 and 30 fruit pods. Each tree produces annually between 0.45 Kg and 2.25 Kg of seed kernels, which we know as cocoa beans.

There are three primary classifications of pods:

- 1) Criollo, the most elite of cocoas. It has soft and thin-skinned pods, which have a light color. They have a very unique, pleasant mild aroma. Its yield tends to be smaller than that of other varieties and it takes longer to ripen. However, the seeds are of finer quality than any other variety, and the most exclusive and treasured chocolate comes from Criollo beans.
- 2) Forastero, has a more plentiful type and accounts for most of the world's chocolate. This variety has a thick-walled pod, and a pungent aroma. It's a rather a bitter and harsh type of cocoa.
- 3) Trinitario, which is believed to be a natural cross from strains of Criollo and Forastero, possesses a good and aromatic flavor.



high-quality raw cocoa. The technique varies depending on the growing region. In some places the beans are placed in heaps, in others they are laid out in baskets or large boxes. The beans are usually covered with banana leaves and branches, or a layer of pulp from the pods. The covering starts to heat up and ferment the beans. Fermentation lasts from two to nine days. Criollos need about two days. Forasteros and Trinitarios take a week or more. The timing is crucial, the beans should not be fermented for too long, or to not be pulled from the pulp too quickly.

The temperature also plays a role in chocolate flavoring when the beans are roasted. The true cocoa aroma develops later during the drying and roasting operations. In the final stages, the beans of the Criollo variety turn to a brownish-yellow color, and those of the Forastero variety become violet-brown, a sign that the cocoa is now ready for drying.

Drying is important to preserve the beans. After fermentation, the raw cocoa is still about 60% water. During drying, beans lose nearly all their moisture and more than half of their weight. They take on a browner coloring and the aroma becomes more pronounced.

After the beans had been fermented, dried and cleaned, they are placed in sacks. Beans would be classified by three grades depending on the color of the center of the beans where purple centers indicate incomplete fermentation.

| Grade | Specification (i.e. % purple bean allowed) | Estimated % of exports, all beans including with PB | Estimated % of exports, all beans without PB |
|-------------|---|---|---|
| Grade 1 | Up to 20% PB allowed | 1% | 95% |
| Grade 2 | 21-30% PB allowed | 55% | 3% |
| Grade 2 dot | 31-45% PB allowed | 28% | 1% |
| Grade 3 | 46% plus PB | | |

Note: PB = purple bean discussed in section 4.6 below.

Source: QCD Division, COCOBOD

Depending on the origin of the bean, a unique characteristic can be attributed to it:

- Brazilian beans are said to be slightly smoky but robust
- Guayaquil beans are sweet
- Sumatra beans are acrid
- Indian Ocean cocoas are pungent and sour, but not bitter
- Madagascar beans are strong in flavor and aroma.
- Venezuelan cocoas, primarily criollos, are considered by many to be a delicacy

But most chocolates are the result of a blend of cocoa beans. Once the beans are fermented, they are stored in isolated chambers to protect the sensitive beans from strong odors that might be absorbed. Good air circulation and a cool temperature are important, and the humidity to be regularly checked.

MACRO TRENDS

I- Market Size – Global, Regional and Local

Chocolate is consumed all over the world, and has witnessed a continuous evolution in its consumed form, from being a drink to becoming a specialty product. Currently, a large portion of consumers are demanding low-calories chocolate, products without sugar, as well as vegan products that exclude animal derivatives.¹ The COVID-19 pandemic also boosted the consumption of chocolate as people increased their consumption of snacks throughout the day, given the work-from-home habits, lockdown measures and increased stress and challenging conditions.

There are several factors that impact the consumers' appetite towards chocolate. These include taste, given the perception of chocolate as a product of indulgence, Fair Trade sustainability attribute of chocolate, the brand, an attractive packaging and an adequate portion size, along with some studies concluding that a small portion improves taste perception.²

Global market for cocoa and chocolate was estimated at \$44.35bn in 2019, and is expected to equal \$61.3bn by 2027, growing at a CAGR of 4.4% over the same period.³ The increase in the demand on chocolate and other food preparations containing cocoa (HS code 1806) worldwide, can be highlighted through the global exports of this category of products, which grew by CAGR of 7.3% from \$7.6bn in 2001 to \$29.2bn in 2020.⁴

The largest producers of cocoa are Côte d'Ivoire and Ghana, accounting for 60% of global cocoa production in the cocoa season of 2018/2019, followed by Ecuador, while Indonesia is the largest producer in Asia.⁵ Europe is the largest processor of cocoa beans into cocoa mass, cocoa butter, cocoa powder, chocolate or other cocoa products, with about 40% of the annual harvest being ground in the continent. Also, Europe accounts to about 45% of total cocoa consumption worldwide, followed by the Americas. The U.S. tends to be the larger consumer, followed by Germany, France, the UK, Russia, Japan, Brazil, Spain, Italy, Canada and China.⁶ In terms of chocolate and other food preparations containing cocoa (HS 1806), the main 20 largest exporters represented 85% of total exports in 2020, reflecting a concentration in exporting countries. Market concentration should push Lebanese companies to continuously seek product innovation to be able to circumvent barriers to entry.

¹Chocolate Consumption and Purchasing Behaviour Review: Research Issues and Insights for Future Research, MDPI

²Chocolate Consumption and Purchasing Behaviour Review: Research Issues and Insights for Future Research, MDPI

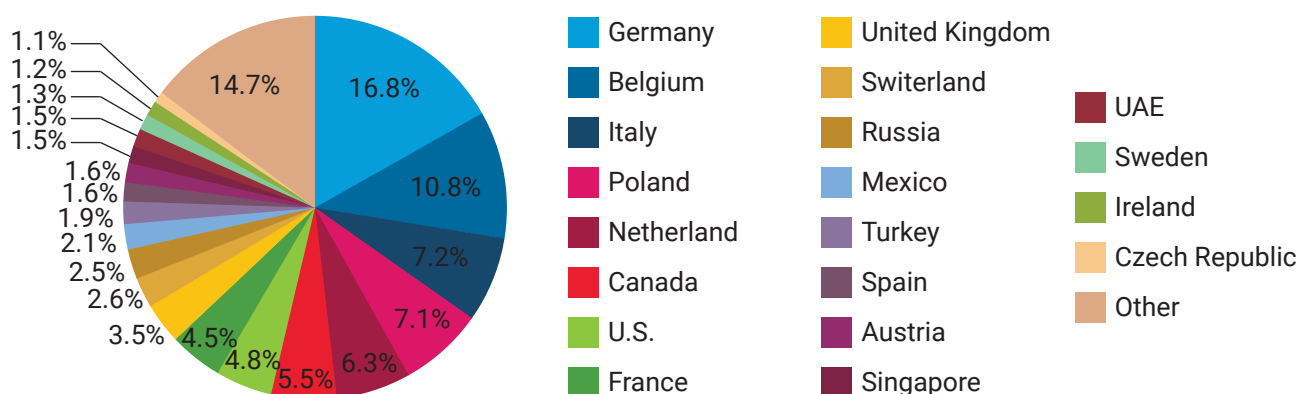
³Food Processing & Processed Food / Cocoa and Chocolate Market, Fortune Business Insights

⁴ITC Trade Map

⁵Swiss Platform for Sustainable Cocoa

⁶Swiss Platform for Sustainable Cocoa

Figure 1: Distribution of exporters of chocolate and other food preparations containing cocoa (HS 1806) in 2020



Source: ITC Trade Map

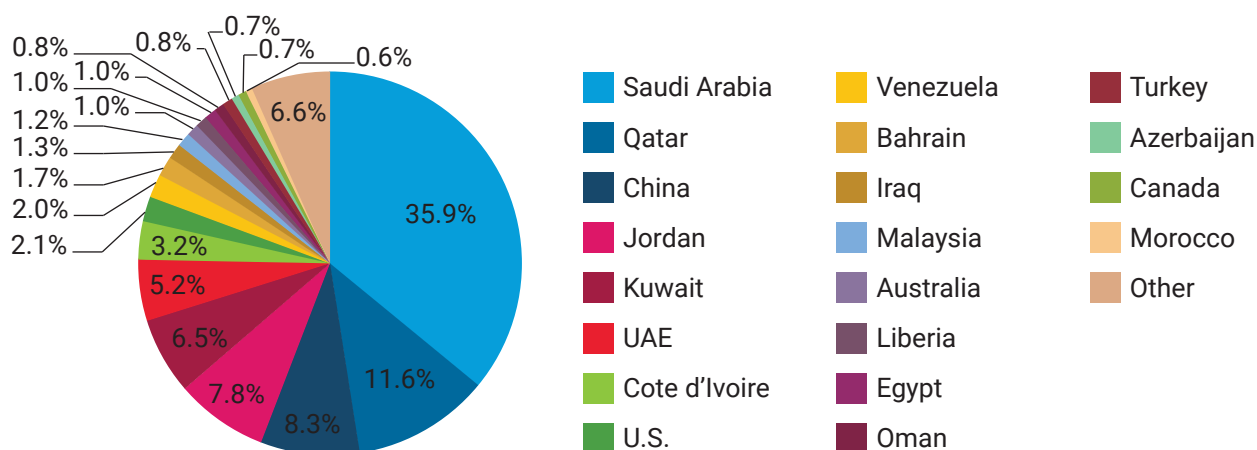
II. Trade Performance

Exports of chocolate and other food preparations containing cocoa (HS 1806) from Lebanon, grew at a CAGR of 12% between 2001 and 2020 reaching \$31.2m and exceeding the global CAGR of 7.3% of chocolate and other food preparations containing cocoa over the same period. However, Lebanon's exports of the aforementioned product peaked at \$50.6m in 2014, showing a currently untapped potential for Lebanese producers.⁷

The main destinations for exported chocolate and food preparation containing cocoa from Lebanon were concentrated in the Gulf Cooperation Council countries, representing a combined share of about 61.7% in 2020.

⁷ITC Trade Map

Figure 2: Main destination of exported Chocolate and other foods containing cocoa from Lebanon in 2020



Source: ITC Trade Map

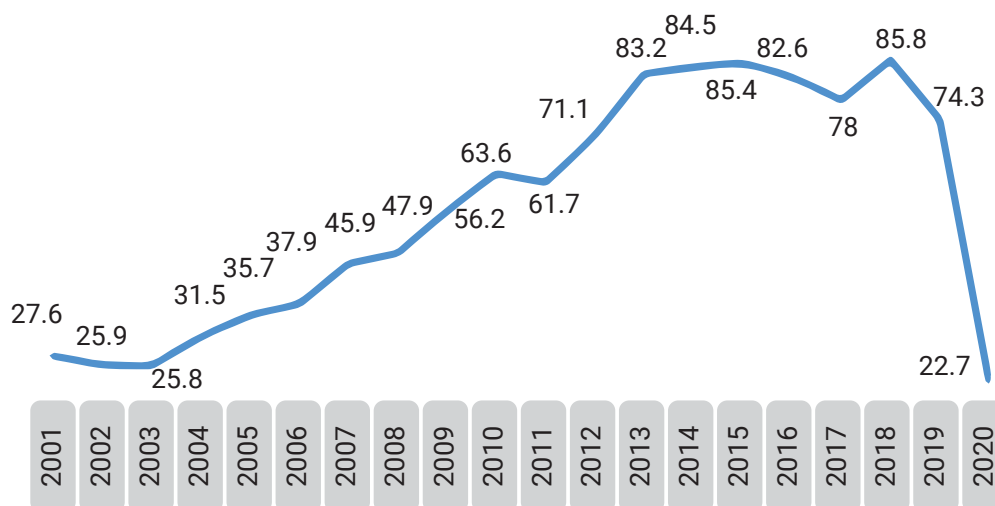
In 2020, exported products, from Lebanon, under chocolate and other foods containing cocoa were mainly composed of chocolate and preparations comprising chocolate in containers or packings of lower or equal to 2kg (excluding in blocks, slabs or bars or cocoa powder), and of chocolate and other preparations containing cocoa, in blocks, slabs or bars of lower or equal to 2kg.

| Code | Product label | Percentage of exported products under HS1806 |
|--------|---|--|
| 180690 | Chocolate and other preparations comprising cocoa, in containers or immediate packings of ≤ 2 kg (excluding in blocks, slabs or bars and cocoa powder) | 62.7% |
| 180631 | Chocolate and other preparations containing cocoa, in blocks, slabs or bars of ≤ 2 kg, filled | 35.8% |
| 180620 | Chocolate and other food preparations containing cocoa, in blocks, slabs or bars weighing > 2 kg or in liquid, paste, powder, granular or other bulk form, in containers or immediate packings of a content > 2 kg (excluding cocoa powder) | 0.6% |
| 180632 | Chocolate and other preparations containing cocoa, in blocks, slabs or bars of ≤ 2 kg (excluding filled) | 0.6% |
| 180610 | Cocoa powder, sweetened | 0.3% |

Source: ITC Trade Map

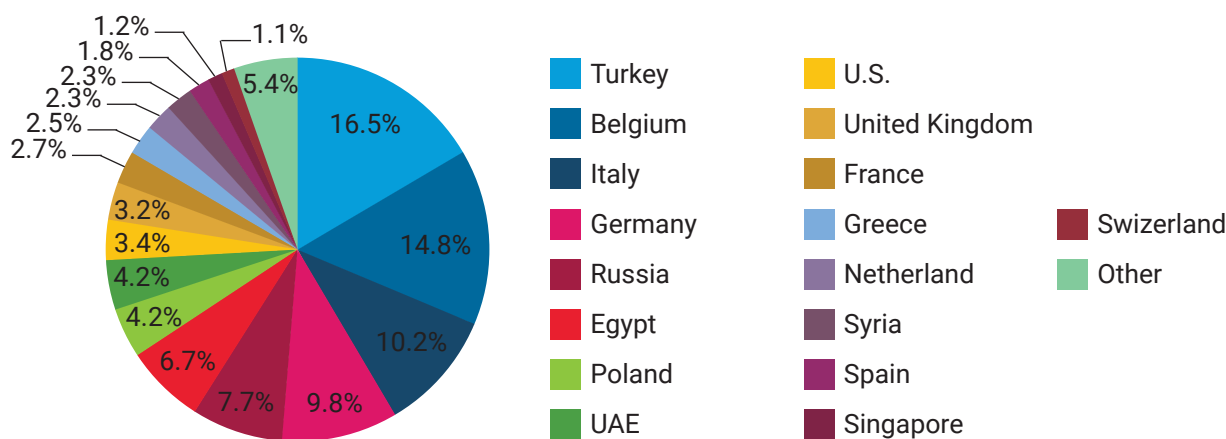
Imports of chocolate and preparations containing cocoa HS 1806 declined by a CAGR of 1% between 2001 and 2020 reaching \$22.8m. They peaked at \$85.8m in 2018, driven by the strong demand for chocolate-based snacks, as well as the large consumption of chocolate-based preparations during special as well as religious occasions, before decreasing significantly to \$22.8m in 2020. This is possibly due to the drop in the purchasing power of consumers in Lebanon amid the depreciation of the Lebanese pound, and the substantial inflation.

Figure 3: Imports of chocolate and preparations containing chocolate in 2020



Source: ITC Trade Map

Figure 4: Lebanon's Main Import Countries of Chocolate and Preparations Containing Chocolate (HS1806) in 2020



Source: ITC Trade Map

The main imported product in Lebanon under chocolate and preparations containing chocolate, are the sub-product (HS 180690) chocolate and other preparations comprising cocoa, in containers or immediate packings of ≤ 2 kg (excluding in blocks, slabs or bars and cocoa powder), which accounted for 48.8% of chocolate imports in 2020. Chocolate and other preparations containing cocoa, in blocks, slabs or bars of ≤ 2 kg, filled (HS 180631) followed with 21.5%, then the chocolate and other food preparations containing cocoa, in blocks, slabs or bars weighing > 2 kg or in liquid, paste, powder, granular or other bulk form, in containers or immediate packings of a content > 2 kg (excluding cocoa powder) (HS 180620) with 17.3%, chocolate and other preparations containing cocoa, in blocks, slabs or bars of ≤ 2 kg (excluding filled) (HS 180632) with 10.4% and cocoa powder, sweetened (HS180610), with 1.9%.⁸

The trade balance in chocolate and food preparations containing chocolate (HS1806) used to reflect a deficit of \$23.7m in 2001, which expanded to \$47m in 2016. However, it shifted to a surplus of \$8.4m in 2020, amid the drop of imports, which showed the potential for Lebanese products to replace the imported ones.

According to the ITC Export Potential, chocolate and other cocoa preparations in blocks, slabs or bars (weighing more than 2 kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, of a content exceeding 2 kg) (HS 180620) have an untapped export potential of \$2.5m, other chocolate and cocoa preparations in blocks, slabs or bars, filled (HS 180631) have an untapped export potential of \$11m, other chocolate and cocoa preparations (HS 180690) have an untapped export potential of \$8.1m, other, cocoa powder (sweetened) (HS 180610) has an untapped export potential of \$1.6m and chocolate and cocoa preparations, not filled (HS 180632), have an untapped export potential of \$402,000.

Chocolate & other cocoa preparations (HS 180631) have a large untapped export potential in Iraq, Kuwait, Jordan, the UAE, Syria, and Egypt. Chocolate & other preparations (HS 180690) have a large untapped export potential in Syria, Iraq, Oman, Canada, and Egypt. Chocolate & other preparations (HS 180620) have a large untapped export potential in similar markets and also in Greece, France, Canada and to a smaller extent in the U.S.⁹

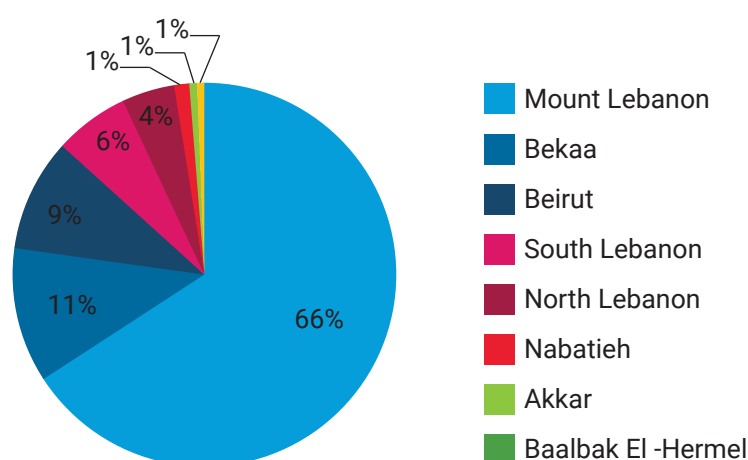
⁸ITC Trade Map

⁹ITC Export Potential Map

III- Supply of chocolate in Lebanon and the region

Cocoa is not produced in Lebanon but is imported. Bakeries coat dried fruits, nuts, and biscuits with chocolate, and serve it in different shapes and flavors.¹⁰ There were more than 120 companies working in the production of chocolate in Lebanon with more than 50% located in Mount Lebanon in 2019.¹¹ Currently, in 2022 there are more than 150 companies registered at the Ministry of Industry that produce chocolate and chocolate-related products.

Figure 5: Chocolate Industries Distribution by Governorate in 2022



Source: ITC Trade Map

The industry in Lebanon is mainly composed of small boutiques. They provide their clients with a large variety of chocolate tastes, ranging from 30 to 50 flavors. Several Lebanese chocolate confectionaries are known worldwide, growing beyond the local market.

Chocolate boutiques used to face high costs in the production process, mainly due to the imported inputs, specifically chocolate of high quality from Europe. In addition, the industry is labor-intensive, which used to represent a major cost center for producer, but with the depreciation of the Lebanese pound, labor has been gaining in competitiveness compared to other producing countries. In addition to that, the electricity cost represents a main challenge for producers as they are coping with new tariffs and higher oil prices. According to a producer of chocolate, the price of chocolate in 2016 used to reflect a portion of 20% to cover chocolate costs, 45% to cover decoration and packaging costs, and a maximum of 35% profit margin.¹²

¹⁰ROAD MAP FOR THE AGROFOOD SECTOR IN LEBANON - UNIDO

¹¹Agri-food sector in Lebanon, 2020 factbook, IDAL

¹²Lebanese Chocolate Industry: The Tempting Market for Exports, Blominvest Bank

The lack of industrial zones is also a challenge facing manufacturers in the agri-food industry, including chocolate, as these zones usually provide companies with lower rental costs than residential areas, as well as reliable electricity service and smoother shipping processes. To overcome these hurdles, Lebanese chocolate producers branded their products for luxury and high-end markets to maximize their margins.¹³

Neighboring countries exporting chocolate and preparations containing cocoa (HS 1806)

Major exporters of chocolate and preparations containing cocoa, in the Mediterranean region and the Middle East, include Italy, France, Turkey, Spain, the UAE, Croatia, Egypt, Greece and Saudi Arabia in 2020. When exporting their products, Lebanese chocolate producers can monitor competitors from different countries, to understand market dynamics, benchmark their products, and identify innovative solutions for their products and for the market entry. Below is a list of the main export destinations of exporters of chocolate in the Middle East and in the Mediterranean regions.

- The main destinations for Italian exports of chocolate and preparations containing cocoa, in 2020, include European countries, the U.S., Australia, Saudi Arabia and Canada, among others.
- The main markets for French exports of similar products, in 2020, include several European countries, the U.S., Canada, Japan, Australia and Russia.
- The main destinations for Turkish exports of these products, in 2020, include Iraq, the U.S., Libya, the UAE, Lebanon, Venezuela, Belgium, South Africa, Yemen, Azerbaijan, Syria, Oman, Japan and Brazil, among others.
- The main markets for Spanish exports of chocolate and preparations containing cocoa, in 2020, include several European countries, Morocco, the U.S., Algeria, Turkey and the UAE, among others.
- The main destinations for Egyptian exports of chocolate and preparations containing cocoa, in 2020, include Saudi Arabia, the UAE, Kuwait, Jordan, Iraq, India, Sudan, Kenya, Oman, Morocco, South Africa and the UK, among others.
- The main markets for exports from such exports from the UAE, in 2020, include Saudi Arabia, Kuwait, Oman, Bahrain, Jordan, India, Iran, Iraq, Yemen, Egypt, Palestine, Morocco and Pakistan, among others.
- The main destinations for Saudi exports of similar products, in 2020, include the UAE, Kuwait, Egypt, Oman, Bahrain, Jordan, Somalia, Libya, Yemen, Iraq, Sudan, Sierra Leone and South Africa, among others.

¹³The Switzerland of the Middle East – The Lebanese Chocolate Industry, Chocolate Class

MEANS OF PRODUCTION

I- Cocoa Types

Depending on the end product in which the cacao bean will transform to, several types of chocolate can be distinguished:

1. Cacao Nibs

Description:

Cacao nibs are the food prepared by removing the shell from cured, cleaned, dried, and cracked cacao beans. The cacao shell content is not more than 1.75 percent by weight.

The cacao nibs, or the cacao beans from which they are prepared, may be processed by heating with one or more of the optional alkali ingredients specified in the paragraph below.

The cacao nibs, or the cacao beans from which they are prepared, as appropriate, may be further processed with one or more of the optional neutralizing agents specified in the paragraph below.



Optional ingredients:

The following safe and suitable ingredients may be used:

- Alkali ingredients: Ammonium, potassium, or sodium bicarbonate, carbonate, or hydroxide, or magnesium carbonate or oxide, added as such, or in aqueous solution. For each 100 parts by weight of cacao nibs, used as such, or before shelling from the cacao beans, the total quantity of alkali ingredients used is not greater in neutralizing value (calculated from the respective combined weights of the alkali ingredients used) than that of 3 parts by weight of anhydrous potassium carbonate.
- Neutralizing agents: Phosphoric acid, citric acid, and L -tartaric acid, added as such, or in aqueous solution. For each 100 parts by weight of cacao nibs, used as such, or before shelling from the cacao beans, the total quantity of phosphoric acid used is not greater than 0.5 parts by weight, expressed as P2O5. The total amount, singly or in combination, of citric acid and L -tartaric acid is not greater than 1.0 part by weight.

2. Chocolate liquor

Description:

Chocolate liquor is the solid or semi plastic food prepared by finely grinding cacao nibs. The fat content of the food may be adjusted by adding one or more of the optional ingredients mentioned below. Chocolate liquor contains no less than 50 percent or more than 60 percent by weight of cacao fat.

Optional alkali ingredients, neutralized agents and spices, flavors and seasoning may be used as such in the preparation of chocolate liquor.



Optional ingredients:

The following safe and suitable ingredients may be used:

- Neutralizing agents: Phosphoric acid, citric acid, and L -tartaric acid, added as such, or in aqueous solution
- Spices, natural and artificial flavorings, ground whole nut meats, ground coffee, dried malted cereal extract, and other seasonings that do not either singly or in combination impart a flavor that imitates the flavor of chocolate, milk, or butter
- Salt

Nomenclature:

The name of the food is "chocolate/cocoa liquor", "cocoa mass", "unsweetened chocolate", "bitter chocolate", "cocoa paste"

3. Breakfast cocoa or cocoa powder

Description:

Breakfast cocoa is the food prepared by pulverizing the material remaining after part of the cacao fat has been removed from ground cacao nibs. Cocoa butter content varies according to the type of cocoa: "Cocoa Powder, Fat-reduced Cocoa Powder Highly Fat-reduced Cocoa Powder.

Breakfast cocoa or cocoa powder may be spiced, flavored, or seasoned with one or more of the following ingredients: Spices, natural and artificial flavorings, and other seasonings that do not either singly or in combination impart a flavor that imitates the flavor of chocolate, milk, butter, or Salt.



Nomenclature:

Cocoa Powder (COCOA BUTTER CONTENT is more or equal to 20 %), Fat-Reduced Cocoa Powder (COCOA BUTTER CONTENT is greater or equal to 10 and less than 20), Highly Fat reduced Cocoa Powder (COCOA BUTTER CONTENT is less than 10),

The labelling of the product must be in accordance with the updated Lebanese standard NL 7 (Cocoa Powders (Cocoas) and Dry Mixtures of Cocoa and Sugars).

II- Chocolate Production

Chocolate is a product that requires complex procedures to be produced. The process involves harvesting coca, refining coca to cocoa beans, and shipping the cocoa beans to the manufacturing factory for cleaning, coaching, and grinding.

The transformation that cocoa beans undergo to become chocolate, is done in 9 steps:

a. Cleaning

The process of making chocolate, starts with the cocoa beans being passed through a machine that removes dried cocoa pulp, pieces of pod and other extraneous material. The beans are carefully weighed and blended according to specifications. Finally, the last vestiges of wood, jute fibers, sand, and even the finest dust are extracted by powerful vacuum equipment. The separated cocoa bean husks are passed on to the chemical industry which extracts valuable compounds.

b. Roasting

To bring out the characteristic chocolate aroma, the beans are roasted in large rotary cylinders. Depending upon the variety of the beans and the desired end result, the roasting lasts from 30 minutes to two hours at temperature of 120 degrees Celsius and higher. As the beans turn over and over, their moisture content drops, their color changes to a rich brown, and the characteristic aroma of chocolate becomes evident. Although all steps are important, proper roasting is one of the keys to good flavor.

c. Shell Removal

The cocoa beans are cooled quickly and their thin shells, which have become brittle by roasting, are removed. A giant winnowing machine passes the beans between serrated cones so they are cracked rather than crushed. In the process, a series of mechanical sieves separate the broken pieces into large and small grains while fans blow away the thin, light shell from the meat or "nibs." Here's where the first secrets of the chocolate manufacturer come in. The nibs are blended, combining as many as 8-10 varieties. It is the control of these subtle mixtures that maintain the constant quality and brings out the flavor of each particular variety of chocolate.

d. Grinding Nibs

The nibs, which contain about 53 % cocoa butter, pass through refining mills and are ground between large grinding stones or heavy steel discs creating a cocoa paste. The paste is subjected to hydraulic pressure, and the cocoa butter flowing out is a pure and valuable fat with a marked aroma; after filtering and purifying it, it looks very much like ordinary butter.

The cocoa butter has important functions. It not only forms part of every recipe, but it also later gives the chocolate its fine structure, beautiful luster, and delicate, attractive glaze. The heat generated by grinding, causes the cocoa butter or fat to melt and form a fine paste or liquid known as chocolate "liquor". When the liquid is poured into molds and allowed to solidify, the resulting cakes are unsweetened or bitter chocolate.

e. Separation

Up to this point, the manufacturing of cocoa and chocolate is identical. The by-product of cocoa, cocoa butter is the essential component of chocolate and consists of about 25% of the weight of most chocolate bars.

To make cocoa powder chocolate liquor is pumped into hydraulic presses weighing up to 25 tons, and when the pressure is applied, 80% cocoa butter is removed. The fat drains away through metallic screens as a yellow liquid, and then is collected for use in chocolate manufacturing. Cocoa butter, unique among vegetable fats, is a solid at normal room temperature and melts at 31 to 34 degrees Celsius, just below body temperature. With proper storage conditions, cocoa butter can be kept for years without spoiling.

The "cake" which is left, may eventually be made into cocoa powder by being further crushed, milled and finely sifted. Three or five vertically mounted steel rollers rotate in opposite directions. Under heavy pressure, they pulverize the tiny particles of cocoa and sugar down to a size of approx. 30 microns. (One micron is a thousandth part of a millimeter)

On another note, Cocoa powder must be in conformance with the Lebanese standard NL 7:21 Cocoa Powders (Cocoas) and Dry Mixtures of Cocoa and Sugars.

f. Conching

This process develops flavors and changes the texture during controlled temperatures. It's the last and most important refining process, which allows the separate flavors of the individual ingredients to combine. Conches [the paddles of the early machines resembled conch shells] are equipped with heavy rollers that plow back and forth through the chocolate paste, anywhere from a few hours to several days. Contemporary technologies can grind the chocolate particles extremely fine, which can reduce conching times. Swiss and Belgian chocolate are conched as much as 96 hours.

Some chocolates are not conched at all, or for only 4 to 12 hours.

Under regulated speeds and temperatures, these rollers can produce different degrees of agitation and aeration to create distinct chocolate flavors. The process can eliminate any remaining bitterness by aerating the chocolate and expelling volatile acids.

Additional cocoa butter and lecithin are added which help to achieve the characteristic velvet smoothness. And as the ultimate homogeneity of the ingredients is developed, a soft film of cocoa butter begins to form around each of the extremely small particles. The chocolate no longer seems sandy, but dissolves meltingly on the tongue. It has attained the outstanding purity which gives it its reputation. The last stage of conching Swiss or Belgian chocolate is a magnificent sight, where huge paddles are rolling slowly through great vats of chocolate, smooth, creamy and thick.

Circular conches use a rotary movement and can hold 9 tons of chocolate. They are the most efficient of the conch machines in some manufacturing setups; there is an emulsifying operation that either takes the place of conching [or supplements conching]. Emulsifying is breaking up sugar crystals and other particles in the chocolate mixture to give it a fine, velvety smoothness. The machine works like an eggbeater.

g. Tempering

Tempering thickens the chocolate and imparts the right flow properties for filling the molds. This complex operation is performed in the tempering plant and is necessary to give the final chocolate product a delicate composition, a uniform structure and a well-rounded flavor. The storage life is also increased in this way.

The still warm conched chocolate is placed in a tempering machine so that it can be slowly and steadily cooled. Cooling chocolate at a fixed rate keeps the flavor from being compromised, and prevents separation when the chocolate is poured into bar molds. Proper tempering also results in a silky sheen and crisp "snap" when broken... another sign of a superior quality chocolate bar. The tempered chocolate is poured into molds of many sizes, from individual sized bars to a ten-pound block used by confectionery manufacturers.

h. Storage

A necessary step, conches are always filled with the largest amounts of chocolate for efficiency, the molding machines can only accept small amounts of chocolate paste at one time, in order to shape it into bars. Chocolate is frequently shipped in a liquid state to other food manufacturers, or it can be stored for short periods of time. For longer periods, it is solidified, usually in the form of hundredweight blocks. These blocks must be reheated before further processing so that they liquefy again.

III- Chocolate types (composition)

Chocolate is the generic name for the homogenous products complying with the descriptions below. It is obtained by an adequate manufacturing process from cocoa materials which may be combined with milk products, sugars and/or sweeteners, and other additives. Other edible foodstuffs, excluding added flour and starch (except for Chocolate familiar a la taza and Chocolate a la taza) and animal fats other than milk fat may be added to form various chocolate products. These combined additions shall be limited to 40% of the total weight of the finished product, subject to the labelling provisions of the updated Lebanese standard NL 206: Labelling of Prepackaged Foods.

The addition of vegetable fats other than cocoa butter shall not exceed 5% of the finished product, after deduction of the total weight of any other added edible foodstuffs, without reducing the minimum contents of cocoa materials.

- Dark chocolate الشوكولا السوداء (in some regions also named bittersweet chocolate, semi-sweet chocolate, dark chocolate or “chocolat fondant”) shall contain, on a dry matter basis, not less than 35% total cocoa solids, of which not less than 18% should be cocoa butter and not less than 14% fat-free cocoa solids.
- Sweet chocolate الشوكولا الحلوة is the solid or semi plastic food prepared by intimately mixing and grinding chocolate liquor with one or more optional nutritive carbohydrate sweeteners, and may contain one or more of the other optional ingredients (ground coffee, dried malted cereal extract,...) . Sweet Chocolate should contain, on a dry matter basis, not less than 30% total cocoa solids, of which at least 18% should be cocoa butter and at least 12% fat-free cocoa solids.
- Chocolate a la taza شوكولا ألا تازا is a chocolate containing a maximum of 8% m/m flour and/or starch from wheat, maize or rice.
- Chocolate familiar a la taza شوكولا فاميليار ألا تازا is a sweet chocolate and containing a maximum of 18% m/m flour and/or starch from wheat, maize or rice.
- Milk Chocolate الشوكولا بالحليب should contain, on a dry matter basis, not less than 25% cocoa solids (including a minimum of 2.5% fat-free cocoa solids) and a specified minimum of milk solids between 12% and 14% (including a minimum of milk fat between 2.5% and 3.5%);

- Buttermilk chocolate القشدية الشوكولا contains at least 5.5 % milk fat. The optional dairy ingredients are limited to:
 - Sweet cream buttermilk
 - Concentrated sweet cream buttermilk
 - Dried sweet cream buttermilk
 - any combination of the above
- Filled chocolate المحشوة الشوكولا is a product covered by a coating of one or more of the Chocolates, with exception of chocolate a la taza, chocolate familiar a la taza and chocolate para mesa, the centre of which is clearly distinct, through its composition, from the external coating. Filled Chocolate does not include Flour Confectionery, Pastry, Biscuit or Ice Cream products. The chocolate part of the coating must make up at least 25% of the total weight of the product concerned.
- Family Milk Chocolate الحليب الغنية الشوكولا should contain, on a dry matter basis, not less than 20% cocoa solids (including a minimum of 2.5% fat-free cocoa solids) and not less than 20% milk solids (including a minimum of 5% milk fat).
- Milk Chocolate Couverture الكوفارطور بالحليب should contain, on a dry matter basis, not less than 25% cocoa solids (including a minimum of 2.5% non-fat cocoa solids) and not less than 14% milk solids (including a minimum of 3.5% milk fat) and a total fat of not less than 31%.
- Couverture chocolate: الشوكولا الكوفارطور السوداء in the preparation of the product, a mixture of cocoa and chocolate liquor is used in such quantity that the finished food contains, on a dry matter basis, not less than 35% total cocoa solids of which not less than 31% shall be cocoa butter and not less than 2.5% of fat-free cocoa solids.
- Gianduja chocolate الجياندوا السوداء is the product obtained, firstly, from chocolate having a minimum total dry cocoa solids content of 32%, including a minimum dry non-fat cocoa solids content of 8%, and, secondly, from finely ground hazelnuts such that the product contains not less than 20 % and not more than 40% of hazelnuts. The following may be added:
 - Milk and/or dry milk solids obtained by evaporation, in such proportion that the finished product does not contain more than 5% dry milk solids.
 - Almonds, hazelnuts and other nut varieties, either whole or broken, in such quantities that, together with the ground hazelnuts, they do not exceed 60% of the total weight of the product.

- “Gianduja” (or one of the derivatives of the word “Gianduja”) Milk Chocolate شوكولا الجياندوا بالحليب is the product obtained, firstly, from milk chocolate having a minimum dry milk solids content of 10% and, secondly, from finely ground hazelnuts such that the product contains not less than 15 % and not more than 40% of hazelnuts.

The following may be added: Almonds, hazelnuts and other nut varieties, either whole or broken, in such quantities that, together with the ground hazelnuts, they do not exceed 60% of the total weight of the product.

- Chocolate para mesa شوكولا بارا ميزا is an unrefined chocolate in which the grain size of sugars is larger than 70 microns. Chocolate para mesa should contain, on a dry matter basis, not less than 20% total cocoa solids (including a minimum of 11% cocoa butter and a minimum of 9% fat-free cocoa solids).
- Semi-bitter chocolate para mesa شوكولا بارا ميزا النصف حلوة should contain, on a dry matter basis, not less than 30% total cocoa solids (including a minimum of 15% cocoa butter and a minimum of 14% fat-free cocoa solids).
- Bitter Chocolate para mesa شوكولا بارا ميزا السوداء should contain, on a dry matter basis, not less than 40% total cocoa solid (including a minimum of 22% cocoa butter and a minimum of 18% fat-free cocoa solids).

IV- Food Additives

Mainly there are 2 types of food additives that can be added to chocolate:

- Acidity regulators, antioxidants, bulking agents, colors (for surface decoration purposes only), emulsifiers, glazing agents and sweeteners used in accordance with the updated Lebanese standard about additives NL 761
- The flavorings used in products covered by this standard should comply with the Guidelines for the Use of Flavorings (CAC/GL 66-2008). Only those flavorings that do not imitate chocolate or milk flavors are permitted at GMP, except for vanillin and ethyl vanillin, at a maximum level of 1000 mg/kg, singly or in combination.

V- Plant Facilities and Operating Requirements

- Chocolate should be manufactured according to requirements set out in the mandatory standard 656:2002 (General Principles of Food Hygiene) and its related mandatory Guideline, as well as the Decisions of Minister of Industry: 1/1 dated on 1/5/2015 (General requirements in food processing establishments) and 84/1 dated on 30/12/2021 (Requirements for Food Processing Establishments in terms of GMP and Lebanese Standards)
- Chocolate must comply with the criteria established in the updated Lebanese standard Chocolate and Chocolate Products NL 208.

VI- Plant Facilities and Operating Requirements

When making chocolate, often there is a special recipe that makes the final products unique. Whether it is a small-scale factory or an industrial-scale production facility, there are technologies that can help improve the quality of the end product.

The main machines required to manufacture chocolate are:

1. Roasters

Roasting is one of the most important, yet misunderstood aspects of chocolate making. Some makers go to extreme lengths to produce accurate-to-the-second roasting profiles, while others describe their unroasted products as 'raw' chocolate.

The sorting and roasting are the only phases in the process where external contaminants can be removed. Sorting can remove physical hazards that are visible to the eye (sticks, stones, insects, sacking material, etc.) and roasting can minimize biological hazards such as salmonella and E. coli.



To be sure that the roasting is safe, it is recommended to roast at $> 100^{\circ}\text{C}$ for at least 15 minutes, then have your beans be analyzed by a local laboratory before and after testing. Roasting cannot remove chemical hazards such as heavy metals from cocoa beans.

Benefits of roasting:

- Roasting transforms the acidic, vinegary smell of fermented beans into delicious chocolate aromas as a number of chemical processes take place inside the bean.
- Roasting helps reduce the moisture content of the bean. Water and chocolate don't mix, so anything we do to reduce the moisture content is going to give us a much easier time when it comes to grinding the beans.
- The roasting process helps separate the husk of the bean from the nib.

A roasting profile is a graph of temperature over time for the center of a cocoa bean during the roasting process. A good roasting profile should:

- Eliminate biological hazards
- Develop the full flavor of the cocoa bean
- Stop before reaching a point where the heat destroys those flavors

The best way to develop a roasting profile for a new bean (or roaster) is by trial and error; prepare a series of roasts at different temperatures, remove and taste beans at fixed intervals.

The natural flavor notes are an important consideration in themselves. It is preferred to make a high roast on beans that have high acidity and naturally punchy flavors but make low roasts with more delicately flavored beans.

The most important thing to remember when developing roasts is to document your results. Create a simple spreadsheet and log the date, bean variety, roast details, and your own thoughts on the results. Keeping good notes from the very beginning will make it much easier to make changes in six months' time.

Building a precise roasting profile for a particular variety of cocoa beans is all well and good, but it quickly becomes meaningless if you don't pay attention to cooling.

The chemical reactions associated with roasting will continue for as long as the beans are hot, so the rate of cooling is almost as important as the roast itself. If some of your roasts take an hour to cool and others ten minutes, you may end up with very different results.

The easiest way to deal with this is simply to cool your beans back to ambient temperature as quickly as possible.

2. De-Hulling or Winnowing

In cocoa and chocolate manufacturing, the de-hulling of cocoa beans is without doubt one of the most important process steps. The efficiency of a de-hulling plant has a direct influence on the economy of a production line. The main thing is to prevent nib loss - the valuable part of the cocoa bean - in order to ensure maximum yield. An optimally functioning de-hulling machine ensures clean separation of the nibs and shell.



During the de-hulling step, the beans are being cracked to separate the shell fragments from the bean kernels (nibs). During this process the critical target is to achieve the highest possible nib's purity rate, without losing nibs particles along with the shells removal. To achieve this, the broken beans, a mixture of nibs and shells, is preferable divided into fractions to enable a well-adapted separation process for each fraction particle size.

Subjecting the roasted cacao beans to infrared before introducing them to the de-hulling machine, provide higher yield where the infrared radiation plays a direct role in separating the hull from the nib. That being said a strict specification must be applied to optimize yield and ensure products safety:

- Infra-red radiation must have a wavelength between 2 and 6 microns.
- Cacao beans are subjected to the appropriate field of radiation for a period between 40 and 100 seconds strictly.

3. Chocolate Grinding Machine

Once the cocoa has been winnowed, it goes into the grinder for the remainder of the process before it is tempered and molded. The initial phase involves grinding the nibs to a fine texture and subsequently a paste as the cocoa butter gets released. Additives, if any, such as sugar or dried fruits go into the grinder at this point. Extra cocoa butter, if desired, goes in a little later in the grinding process.



4. Refiner

Refining is the final grinding of all particles in the liquid chocolate, to produce an even extremely smooth texture in which no grit can be detected on one's tongue or pallet. This process generates the overall refining of cocoa particles by pulverizing to a dimension of 17 microns. Which are smaller than the taste buds.

5. Conche Machine

The process involves heating and mixing from several hours to several days the ingredients of chocolate - cocoa, cocoa butter, sugar, any additive and "flavoring" such as vanilla or essential oils. For milk chocolate, dry milk powder is also included in the mix. (Don't try to use liquid milk, it will seize on you). During conching, the chocolate is heated to temperatures of 40 to 80°C, sometimes externally just from friction. In the "industry" many milk chocolates are heated to temperatures over 72°C to allow the lactose crystals to transition into amorphous lactose. This transition is often why milk chocolate has that soft and silky mouth feel. Consequently, during Conching the sharp taste of the fresh cocoa slowly disappears. At the same time the acidity and bitterness of cocoa are lost, and the moisture content is reduced (there is actually debate over this) and the delicious chocolate flavor becomes fully developed. Simultaneously in the process, the smoothing of the cocoa and sugar particles takes place with cocoa butter forming around each of the small particles. This is different from refining really. The particles of sugar and cocoa are smoothed out in conching but not substantial reduced in size. Conching last for several hours or up to three days. Finally, there are basically two thoughts on conching - low and high shear. When conching was discovered, there was only low shear, and this is probably why it could take up to 3 days. With modern equipment, there have been a number of conching advancements, notably high shear conches. These supposedly (there again is great debate) can conch a batch of chocolate in under 15 minutes. The high shear causes the volatile components to be quickly liberate from the cocoa mass.



There is no real right way or amount of time to conch. It is up to you and what you want your final chocolate to be like. Certain Criollo cocoa beans are chosen because they are bright and fruity. You would not really want to conch that for 3 days because you are just going to drive off those qualities that you chose the bean for in the first place. And you will need to keep in mind, a balance that desirable and undesirable compounds are driven off during conching. The trick is to find that combination of conditions (low or high shear, high or low heat, short or long time) that gives the chocolate flavor you want. Conching is probably the least understood process in modern chocolate making and consequently the most Alchemical of the processes.

VII- Labeling

In addition to the requirements of the updated Lebanese Standard for the Labelling of Prepackaged Foods NL 206, the following declarations should be made:

- Name of the food: chocolate should be designated according to the names listed in Section 4. When sugars are fully or partly replaced by sweeteners, an appropriate declaration should be included in proximity of the sales designation of the chocolate, mentioning the presence of sweeteners. Example: "X Chocolate with sweeteners".

The use of vegetable fats in addition to Cocoa butter must be indicated on the label in association

with the name and/or the representation of the product




- Declaration of minimum cocoa content: except for white chocolate, different types of chocolate should carry a declaration of cocoa solids. For the purpose of this declaration, the percentages declared shall be made on the chocolate part of the product after the deduction of the other permitted edible foodstuffs.
- List of ingredients and additives in a descending order.
- Allergen information
- Net quantity
- Storage conditions and date of production
- Name and address of manufacturer
- Lot number or production date (day/month/year)
- Shelf life
- Other Information Required: any characterizing flavor, other than chocolate flavor should be in the designation of the product. Ingredients, which are especially aromatic and characterize the product must be part of the name of the product (e.g., Mocca Chocolate.
- Assorted Chocolates: where chocolate products with exception of chocolate a la taza, chocolate familiar a la taza and chocolate para mesa, are sold in assortments, the product name may be replaced by the words "Assorted Chocolates" or "Assorted filled Chocolates", "Assorted Chocolate Vermicelli", etc. In that case, there has to be a single list of ingredients for all the products in the assortment or alternatively lists of ingredients by products;
- Filled Chocolate: should be designated "Filled Chocolate", "X Filled Chocolate", "Chocolate with X Filling" or "Chocolate with X Centre", where "X" is descriptive of the nature of the filling. The type of chocolate used in the external coating may be specified,
- A Chocolate or Praline: products in a single mouthful size shall be designated "A Chocolate" or "Praline".
- Use of the Term Chocolate: products where the chocolate taste is solely derived from non-fat cocoa solids, can carry the term "chocolate" in their designations;

- Labelling of non-retail containers: the information required must be given either on the container or in accompanying documents, except that the name of the product, lot identification, and the name and address of the manufacturer, packer, distributor and/or importer should appear on the container. However, lot identification, and the name and address of the manufacturer, packer, distributor and/or importer may be replaced by an identification mark provided that such a mark is clearly identifiable with the accompanying documents.
- Country of origin
- Nutritional declaration

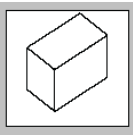
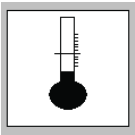
VIII- Packing and Transportation

Food contact materials must be food grade, appropriate, clean and provide protection against deterioration from external factors.

Chocolate is mainly wrapped in aluminum foil or composite films, paper or plastic trays and then packaged in batches in mill- and corrugated board cartons. To provide the cartons with greater stability, they are strapped with plastic or metal strapping. The packaging size of the cartons is so selected that the dimensions of the individual area modules or area module multiples are conformed to the conventional pallet sizes (800×1200 mm and 1000×1200 mm) and cargo units may thus be produced.

| Marking of packages | | |
|---|---|---|
|  |  |  |
| Keep dry | Top | Keep away from heat (solar radiation) |

Symbols:

| | |
|---|---|
|  |  |
| General cargo | Temperature-controlled |

Means of transport

Ship, truck, railroad, aircraft

Container transport

The basic problem with transporting chocolate in containers is its relatively low melting point. Solar radiation and other external influences (heat sources, such as double bottom tanks, engine rooms) may cause the temperature in the container to rise considerably and exceed the melting point, therefore making enormous quality degradation inevitable. Factors having a decisive influence on the selection of an appropriate container type are the season, the route, the duration of the voyage and the container stowage space on board. Standard containers do not offer any protection against external temperature fluctuations, as the external temperature is transmitted very quickly through the relatively thin walls into the inside of the container, in particular in the case of solar radiation. If chocolate is to be transported in containers, refrigerated containers (integral units or porthole containers) are therefore more suitable. Due to their insulated walls, these are less sensitive to external temperature fluctuations and the connected refrigeration units allow the required travel temperature to be maintained. However, problems may arise with this container type if the refrigeration units are not switched on, and reliance is placed solely upon the higher level of insulation. Even with these containers, direct solar radiation for example may rise the internal temperature to a critical value. In general, it is essential to maintain the cold chain throughout transport.

Cargo handling

It is also imperative that the goods be protected from moisture (rain, snow) during cargo handling and from excessively low and high temperatures, as the packaging (paperboard cartons) is extremely sensitive to moisture and loses stability. Damp conditions may also reduce the quality of the chocolate itself, for example by causing sugar bloom, rancidity, mold and a musty odor. Since the cargo is relatively sensitive to breakage, the packages must be handled with appropriate care.

Stowage space requirements

Cool, dry. To provide protection against solar radiation, chocolate is best stowed below deck. Under no circumstances, it mustn't be stored near heat sources (heated double bottom tanks, engine rooms), as its melting point is approx. 28°C.

Cargo securing

Because of its considerable impact- and pressure-sensitivity, packages of this cargo must be secured in such a way that they are prevented each other from damaging. Spaces between packages or pallets must be filled, to prevent slippage or tipping. By selecting the correct packaging size or cargo unit (area module or area module multiple), holds can be tightly loaded (without spaces).

RISK FACTORS AND LOSS PREVENTION

Considered as a very delicate products, chocolate can be affected by multiple factors that can have a direct effect on its quality. Below are the highest rated risk factors for chocolate and their respective prevention measure that would help any company minimize retail price loss and preserve their profit.

1. Temperature

Chocolate requires particular temperature, humidity/moisture and possibly ventilation conditions.

| Designation | Temperature range |
|------------------------------|-------------------|
| Favorable travel temperature | 10 – 18°C |
| | 4.4 – 7.2°C |

The optimum storage and transport temperatures are 10 – 18°C. At as high a temperature as 25°C, chocolate deteriorates with respect to both appearance and taste. At 24°C it becomes soft, and slabs, hollow molded figures (e.g. Easter eggs, Father Christmases) and individual filled chocolates become deformed, nuts turn rancid and cocoa butter becomes greasy on exposure to solar radiation.

28°C is the melting point: the fat constituents separate out and then solidify upon re-cooling, a fat bloom forming on the surface of the product, i.e. a gray to gray-blue coating of separated fat. This fat bloom is particularly common in the case of individual chocolates filled with marzipan, nougat and similar fatty fillings.

Chocolate is very susceptible to temperature fluctuations (sugar bloom formation). A sugar bloom forms when moisture is present, which dissolves the sugar in the chocolate. When the water evaporates, the sugar remains on the surface in the form of crystals.

Chocolate may be transported as a refrigerated cargo at 4.4 – 7.2°C; however, there is risk of condensation if refrigerated cargo is unloaded in a warm environment.

Confectionery with a liquid filling, such as liqueur chocolates, does not tolerate any frost, as the sugar crust inside cracks due to expansion of the liquid filling (thermal dilatation), thus requiring particular care in the case of container transport during winter. Individual chocolates filled with soft fondant may also crack.

2. Humidity/Moisture

Chocolate requires particular temperature, humidity/moisture and possibly ventilation conditions (SC VI) (storage climate conditions)

| Designation | Humidity/water content |
|-------------------|------------------------|
| Relative humidity | 60 – 65% |
| Water content | 0.5 – 1.6% |

Chocolate must be protected from all forms of moisture (seawater, rain and condensation water). Excessive humidity or marked temperature fluctuations cause sugar bloom: moisture dissolves the sugar, evaporation of the water causing the sugar to recrystallize in the form of fine crystals. High humidity levels and temperatures also turn chocolate musty, moldy and rancid.

3. Ventilation

If the product is at “shipping dryness”, i.e. the water content of the paperboard cartons is 5 – 8%, ventilation is not normally required.

However, if there is a risk of cargo sweat, which may result, for example, in wetting of the paperboard cartons and thus in a reduction in stability and strength and depreciation of the product itself, the following ventilation measure is recommended:

Where the air exchange rate: 6 changes/hour (airing)

4. Biotic activity

Chocolate displays 3rd order biotic activity.

Chocolate belongs to the class of products in which respiration processes are suspended, but in which biochemical, microbial and other decomposition processes still proceed.

5. Odor

| | |
|-------------------------|---|
| Active behavior | Chocolate has a slight, pleasant odor. Moisture and high temperatures may cause the odor to turn musty. |
| Passive behavior | All cocoa products absorb foreign odors very easily and have therefore to be stored and transported under odor-free conditions. Unsuitable packaging materials may result in an unpleasant off-flavor. The higher is the cocoa butter content, the more sensitive are the products, as cocoa butter absorbs and retains foreign aroma substances. |

6. Contamination

| | |
|-------------------------|---|
| Active behavior | Chocolate does not cause contamination. |
| Passive behavior | Chocolate is extremely sensitive to contamination. It must be protected from dust, dirt, fats and oils. |

7. Mechanical influences

Packages should be handled with appropriate care, as high stresses may lead to damage to carton walls and edges. The chocolate itself is likewise relatively sensitive to breakage.

The packages must be secured appropriately in the hold or container so that they cannot move during transportation. In the case of container transport, it is also important for the goods to be secured in the door area so that they cannot fall out of the container when the doors are opened.

8. Insect infestation / Diseases

Cocoa moths (also known in the US as almond moths) and meal moths may attack chocolate. Nut chocolate may also suffer attack from flour beetles and dried fruit moths. Occasionally, maggots are found in chocolate, particularly if it contains nuts or fruit.

INNOVATION

The new innovative ingredients used in the chocolate industry include citrus flavors, vegetables, nuts, cereals, unusual fruits, rare cocoa, florals, a combination of flavors, and others. Usage of healthy ingredients such as stevia, honey, lactose-free chocolate ingredients, usage of non-hydrogenated fats, and others in the chocolate products have attracted the diabetic population. These innovations notably help in driving the growth of various chocolate products, a good example is the chocolate pudding Pie

Chocolate Pudding Pie

The best part of this pie is that it's made with real ingredients like milk, chocolate, and eggs. It's perfect to make for special occasions. The only part you need to bake is the crust. The rest is oven free.

It's a great dessert that you can make a few hours ahead. Feel free to make it the day before, but be sure to add the fresh whipped cream just before serving.



INGREDIENTS

Cookie Crumb Crust

- 2 cups chocolate wafer crumbs or Oreos
- 6 Tablespoons butter melted

For the filling:

- 2 1/2 cups milk
- 5 oz. semisweet chocolate chopped into slivers
- 4 egg yolks
- 3 /4 cup sugar
- 3 tablespoons cornstarch
- 1 /4 tsp. salt
- 1 1 /2 teaspoons vanilla extract

For the topping:

- 1 cup heavy cream
- 1 Tbs. sugar
- 1 tsp. vanilla extract
- Chocolate curls for decorating

INSTRUCTIONS

Cookie Crumb Crust

Finely crush chocolate wafers or Oreos. Use a food processor blender if possible. Combine chocolate wafer crumbs and melted butter in small bowl. Press in the bottom and up the sides of an 8–9-inch pie plate to form crust.

Chocolate Pudding

1. Using a nonaluminum saucepan heat together the milk and chocolate over low heat. Whisk until the chocolate is melted, it will look speckled.
- 2 In a large bowl, whisk together the egg yolks and sugar until pale yellow. Add the cornstarch and salt, then the vanilla, and whisk until well blended. Slowly pour the warm chocolate mixture into the yolk mixture, whisking constantly until well blended. Return the mixture to the saucepan and cook over medium heat until it thickens and begins to bubble slowly, 6 to 8 minutes. Remove from the heat and stir until smooth, about 1 minute.
3. Pour the filling into the crumb crust and smooth with a spatula. Cover with plastic wrap, pressing it directly onto the surface, and refrigerate until completely cold and firm, 2 to 3 hours.

Whipped Cream

With an electric mixer whisk together the cream, sugar and vanilla on medium-high speed until stiff peaks form. Spread the whipped cream on the chilled pie. Decorate with chocolate curls. Refrigerate until ready to serve. Allow the pie stand at room temperature for 20 minutes before serving to for easier cutting.

CONCLUSION

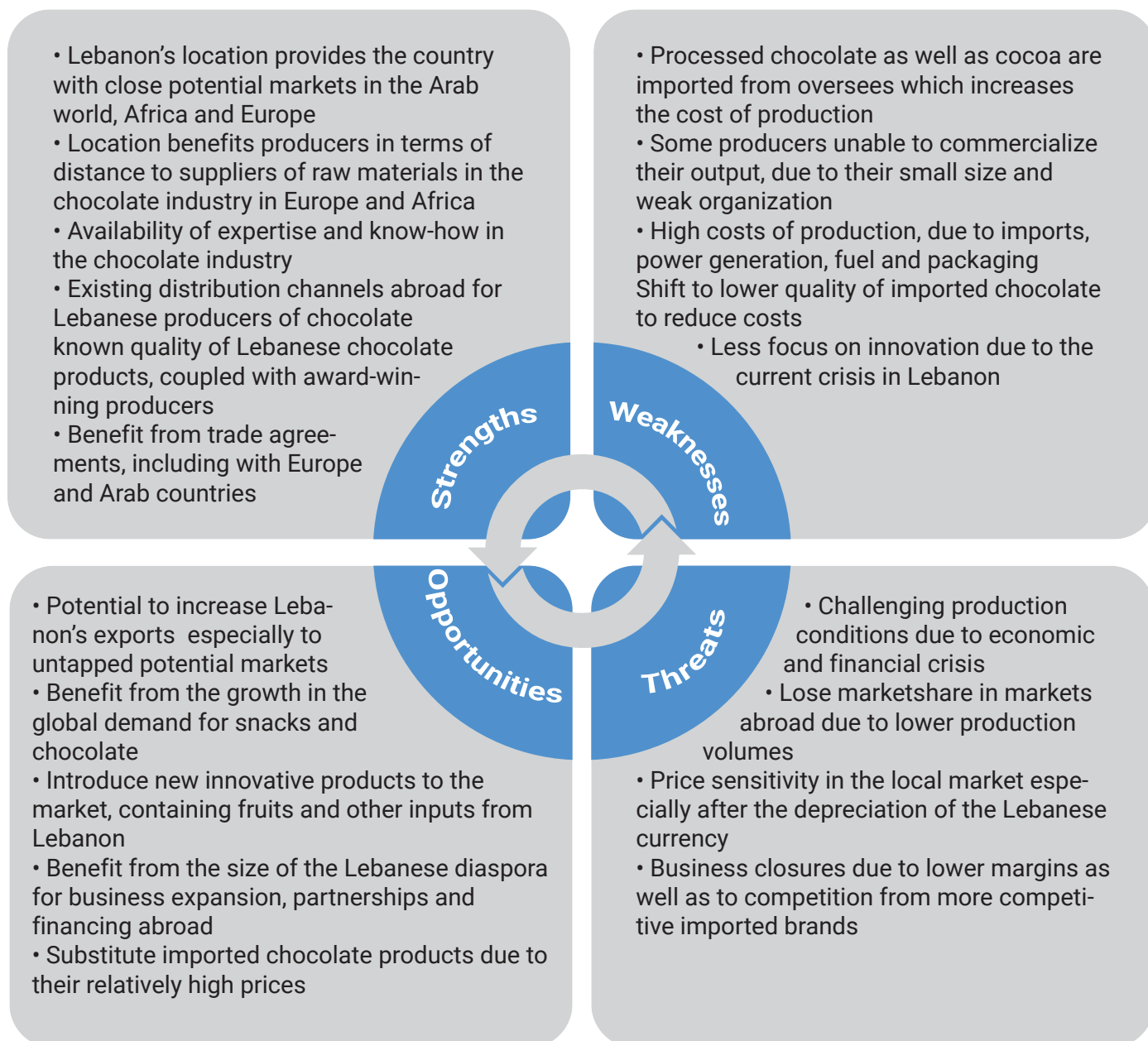
While chocolate is already consumed globally, the COVID-19 pandemic raised the demand for chocolate as snacking increased, to become a part of the work-from-home habits and behavior. Despite not growing cacao, the main input for chocolate-based products, Lebanon gained a reputation in making chocolate across the region and has been able to satisfy a non-negligible share of the local market, following the decline in purchasing power. Bakeries and chocolate makers take advantage and coat dried fruits and biscuits with chocolate. The competitiveness of Lebanese chocolate products has contributed to shifting the balance from a net importer position to a net exporter in 2020. Exports of chocolate represent a large share of exported agri-food products, constituting a major contributor to the sector. Despite the growth in exports, there is still a combined untapped export potential of about \$23.6m for all chocolate-based products under HS code 1806. The main untapped potential for Lebanese exports of chocolate products is in the Arab region, specifically in Iraq, Syria, Egypt, and in some of the GCC countries. While the cocoa is imported from abroad, Lebanese producers are able to produce a product that receives a certificate of origin, which allow producers to benefit from free trade agreements and reduced tariffs and duties.

Lebanese producers should monitor their regional competitors. Major exporters of chocolate and preparations containing cocoa in the Mediterranean region as well as in the Middle East including Italy, France, Turkey, Spain, the UAE, Croatia, Egypt, Greece and Saudi Arabia in 2020. This will allow them to remain well informed about innovation in products, prices and promising market destinations. The main issue faced by producers is the high costs, especially those related to electricity, and also to packaging. As such, finding smart ways to reduce electricity costs through renewable energy can help producers increase their margins and their competitiveness. In addition, innovative ideas for packaging are important to reduce the costs and to make the product more attractive, as the appeal of the packaging and the size are among the factors that get the attention of consumers.

Although chocolate is not a traditional Arabic treat and it was introduced to the region by Europeans, Lebanon has embraced the European chocolate traditions at the height of chocolate making art, while adding local elements and innovations to make it uniquely their own. The Lebanese have always had a proud tradition of food as an art form, and they have also endeavored to export this on a global scale by way of chocolate. Through research on local and global market demands, Lebanese chocolate companies have been able to infiltrate and establish a name for the Lebanese chocolate.

Furthermore, Lebanese chocolate companies are always on the lookout to adopt and introduce new technologies, as well as to participate in regional and international fairs and trainings in order to develop the technical aspects and create new markets for the chocolate industry.

SWOT ANALYSIS



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