

Pre-Feasibility Study Healthy Snacks and Bars Industry

May 2022



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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 that 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 Healthy Snacks and Bars industry within the Lebanese market, as well as 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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ACKNOWLEDGMENTS

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 (Mol) 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, Mol), Mr. Bassam Jouny (Economist, Mol). Oversight and coordination were done by Mr. Kjell Sundin (UNIDO Project Manager) and Ms. Nivine Chahni (Project Coordinator).

DEFINITION

Globally, a relatively substantial number of terms were used to define the natural health-developed food products. For this purpose, the names of functional foods, nutraceutical foods, pharmaceutical foods, designer foods, farmafoods, vitafoods, foodaceutical, etc. were used.

Healthy snacks are food products that are considered nutritious or beneficial for a healthy diet, which are generally consumed in between meals.

Health in snack food is a flexible term. In a commercial

setting, healthy snacks often include a statement or claim that promote the healthy or nutritional value of the product, for example:

- Snacks with reduced amount of unhealthy ingredients: reduced sugar, less fat, no preservatives or additives.
- Snacks with ingredients that promote health: omega-3, wholegrain, plant protein, fibres.
- Snacks developed for a specific objective or diet: gluten-free, vegan, energy snacks for sport.

Healthy snacks may include:

- Consumer products such as crackers, biscuits, cereal bars, bakery products and packaged snack nuts with seeds.
- Ingredients and basic preparations, such as pulse flours and unroasted cereal flakes as well as basic commodities.

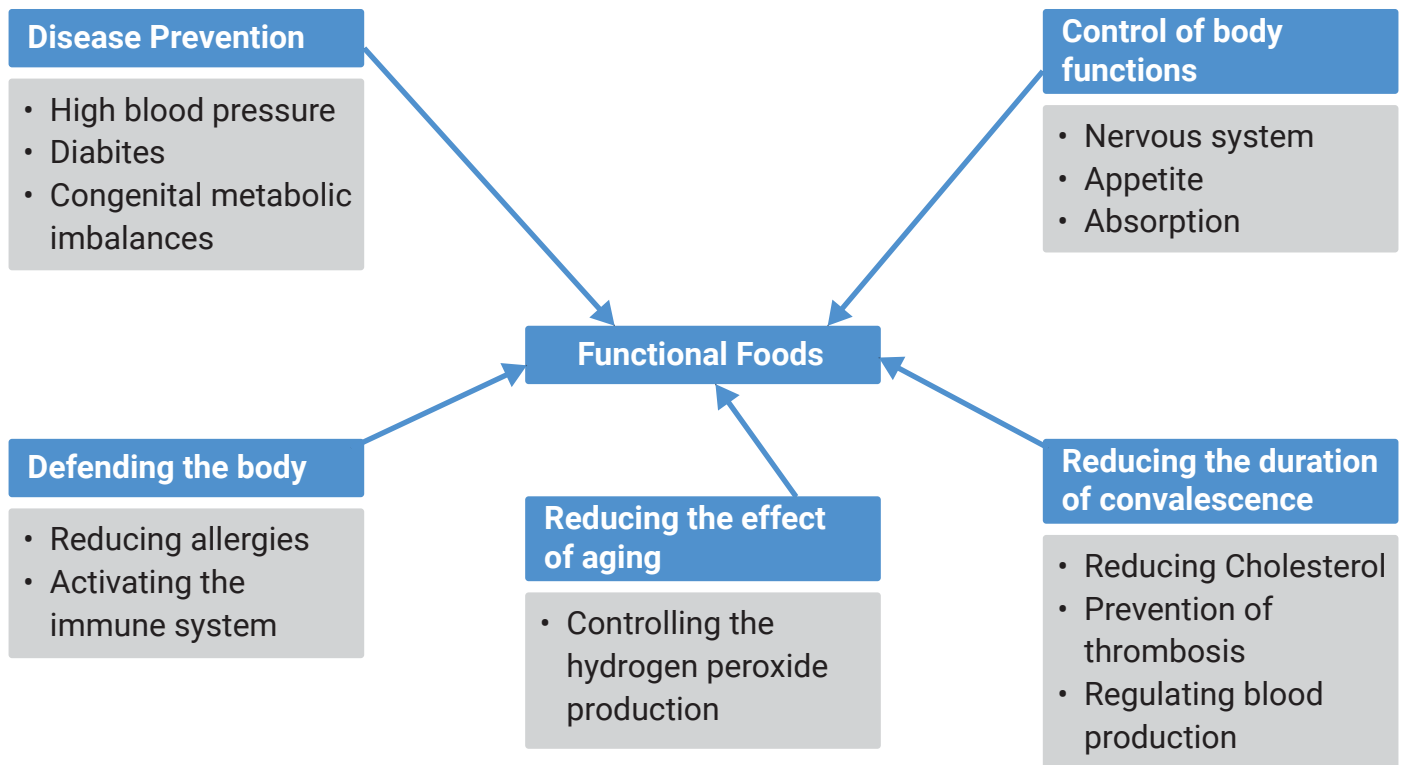
Snack bars are versatile products often made, with cereals, fruits, and nuts and considered to be an ideal food format in delivering healthy nutrients, bioactive compounds, and dietary fiber to the consumers. Often, they fall under the name of functional foods.

There are definitions around the world for functional foods, however there is no official or accepted definition for it; the functional foods are more of a concept than a defined food product group. Therefore, functional food can be natural food, food in which a component has been added or has been removed, food in which the nature of one or more components has been altered, or any combination of these possibilities.

Moreover, the functional food, besides its basic nutritional effect, has also beneficial effects on human body functions (such as improving the general physical state or decreasing the risk of disease evolution). The main roles of functional foods in regulating processes in the body are presented in Figure 1.



Figure 1: The role of functional foods in regulating processes in the body



MACRO TRENDS

I- Market Size – Global, Regional and Local

The global consumption of healthy snacks has been increasing significantly in the past years. The COVID-19 pandemic continues to be a catalyst for the demand of snacks. In this context, the additional pressure from the pandemic through the disruption of work, schools and other forms of everyday life has increased day-to-day snacking¹. A recent poll showed that the snacking habits of U.S. consumers have changed, with 46% of adults in desire for more snacks². Consequently, remote work, spending more time at home and health related issues, all are altering the snacking industry.

The sales of some categories of snacks such as cookies, ice cream, and savoury snacks grew significantly following the start of the pandemic. Also, the consumers' focus on healthy diets pushed manufacturers towards producing healthier snacks. Almost two-thirds of all products across global snacks were related to dietary and health labels as starting from 2020. In addition, the healthy trend of consumers coincided with increased stress from the pandemic in raising the importance of "permissible indulgence", with consumers demanding snacks that do not disrupt their dietary objectives.³

According to Euromonitor International, a large number of consumers is looking for products with limited sugar, including no added sugar, no sugar, no artificial sweeteners and no Aspartame. Also, clean labels including "Free from" products or "natural" foods remain a key aspect of permissible indulgence trends. In addition to these components, immunity-boosting products such as snacks that reduce stress, boost energy and improve focus became increasingly demanded.⁴

The global health and wellness snacks segment is expected to grow at a CAGR of 5.8% from 2020 to about \$98bn in 2025.⁵

Almost 10 years ago the healthy snacks segment was still nascent in Lebanon, as these products only had a couple of shelves in supermarkets. However, the segment grew significantly as several supermarkets dedicated health food sections, and multiple specialty shops started to sell healthy snacks. Most common challenges for "made in Lebanon" products include the elevated cost of production and the difficulty in gaining market exposure.⁶

¹State of the industry 2021: Riding the snacking surge, Snack Food & Wholesale Bakery

²Tracking 2021 Consumer Snack Trends, PCA

³Positioning Snacks for Success in a Post-Pandemic World, Euromonitor International

⁴Positioning Snacks for Success in a Post-Pandemic World, Euromonitor International

⁵The rise of the healthy snack, Nutraceutical Business Review

⁶When snacking becomes healthy, Executive Magazine

In addition, during the pandemic, snacking in Lebanon increased, as the number of people who eat five meals or more per day grew from about 4.9% before the pandemic to 12.3% during the pandemic. The intake of sweets and salty snacks also increased⁷. However, the majority of these snacks are not within the healthy segment. The consumption of healthy products remained niche overall in Lebanon partly due to the lack of awareness about healthy eating habits as well as to the relatively high cost of imported healthy snacks⁸.

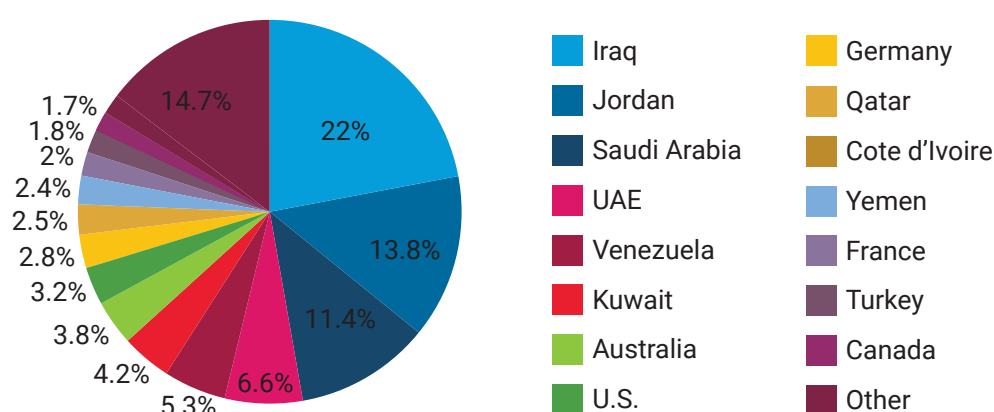
II- Trade Performance

As per the CBI, the Centre for the Promotion of Imports from developing countries to Europe, the main products related to healthy snacks are:

- Bread, pastry, cakes, biscuits and other (HS1905)
- Preparations from unroasted cereal flakes /mixes (HS190420)
- Flour, meal and powder of pulses (HS110610)
- Cereal flours (excl. wheat/maize) (HS110290)

Lebanese exports of healthy bread, pastry, cakes, biscuits and other (HS1905) grew at a CAGR of 5.3% from 2001 to \$15.6m in 2020. They grew at a slower pace than the global growth of 8.2% in this segment over the same period.⁹ The main destinations of Lebanese exports in this segment were Iraq with a share of 22% of the total, Jordan (13.8%), Saudi Arabia (11.4%), the UAE (6.6%), Venezuela (5.3%) and Kuwait (4.2%).

Figure 2: Main exports market of Bread, Pastry, Cakes, Biscuits and Other bakers' ware in 2020



Source: ITC Trade Map

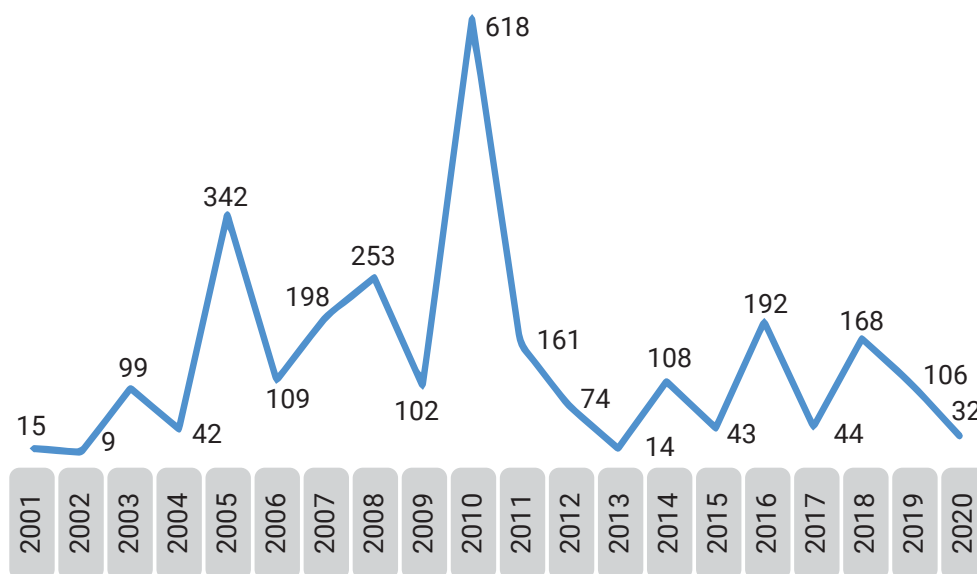
⁷Unfavorable habits: Lebanese adults ate more sweets and snacks, less fruits and veg during lockdown, Food navigator-asia.com

⁸When snacking becomes healthy, Executive Magazine

⁹ITC Trade Map

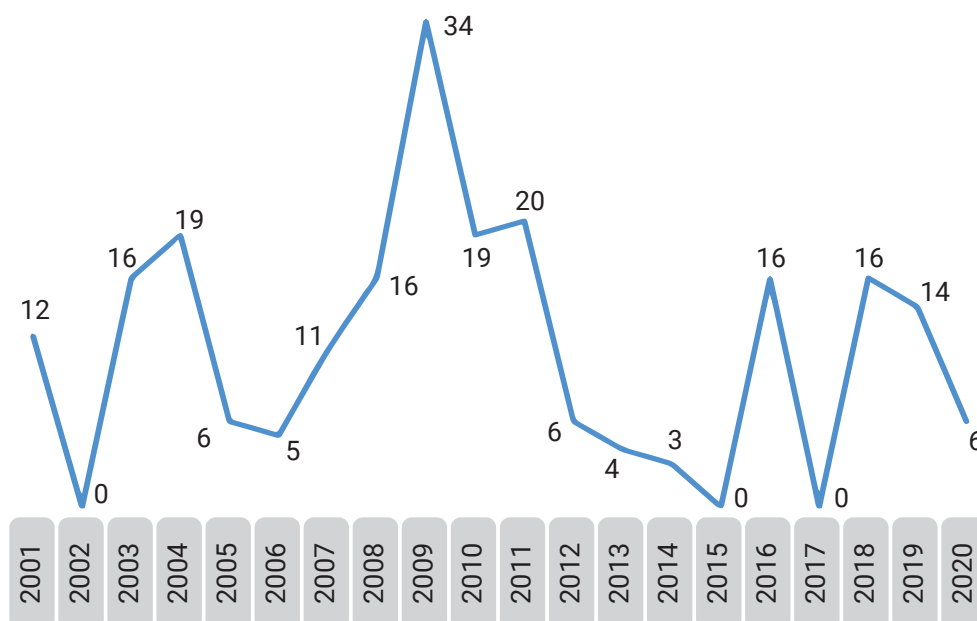
In terms of preparations of healthy unroasted cereal flakes/mixes (HS 190420), as well as flour, meal and powder of pulses (HS 110610) and cereal flours (HS 110290), the exported values from Lebanon were not stable over the past 20 years, and were highly volatile.

Figure 3: Exports of preparations from unroasted cereal flakes/mixes in thousands of \$US 2001-2020



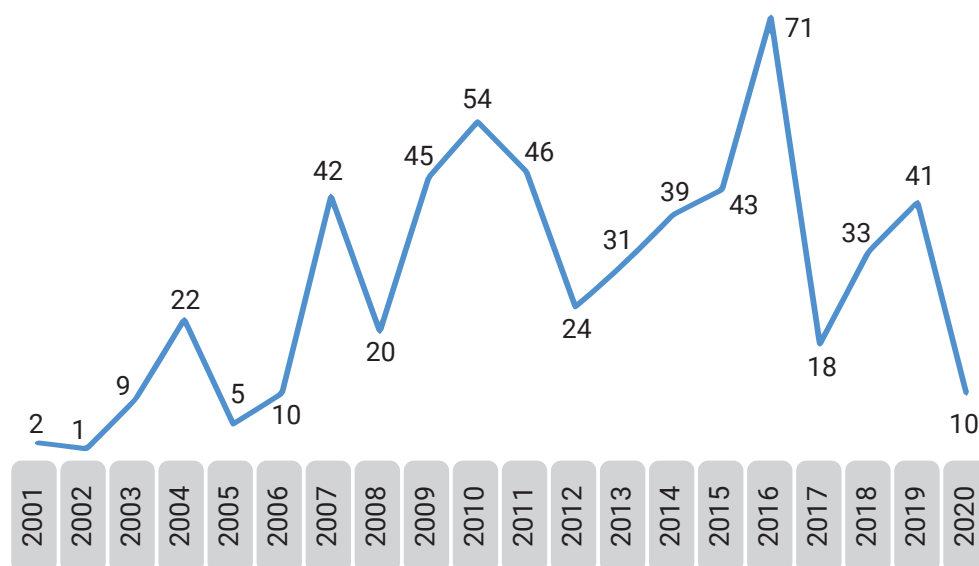
Source: ITC Trade Map

Figure 4: Exports of Flour meal and powder of pulses in thousands of \$US 2001-2020



Source: ITC Trade Map

Figure 5: Exports of cereal flours in thousands of \$US 2001-2020

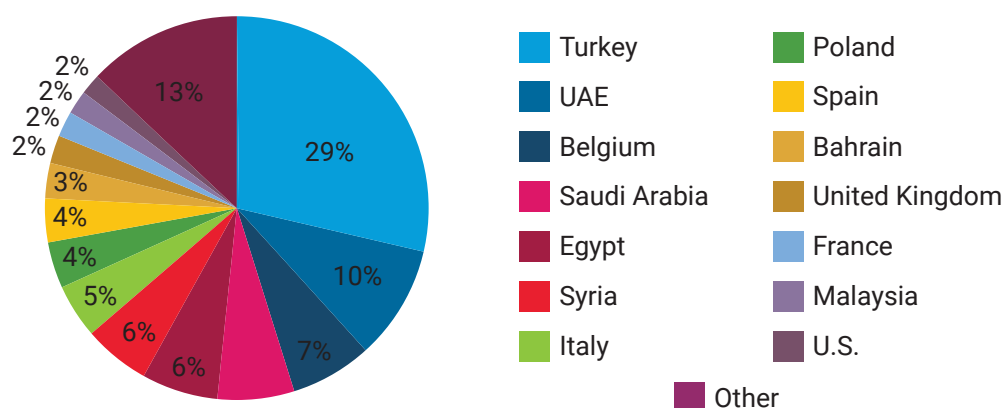


Source: ITC Trade Map

In parallel, Lebanon's imports of healthy bread, pastry, cakes, biscuits and other (HS1905) grew at a CAGR of 0.2% between 2001 and 2020 reaching \$34.8m. In fact, they grew significantly from \$33.6m to \$120.6m in 2018, but they dropped substantially in 2019 and 2020. This coincides with the drop in purchasing power in the local market amid the start of the financial and economic crisis and it also provides opportunity to Lebanese producers to replace imported products.

The main sources of these imports were Turkey, the UAE, Belgium, Saudi Arabia, Egypt, Syria, Italy, Poland, Spain and Bahrain, among other countries.

Figure 6: Main source of imports of products under HS 1905 in 2020



Source: ITC Trade Map

Furthermore, the imports of prepared foods obtained from unroasted cereal flakes of mixtures (HS 190420) grew from around \$48,000 in 2001 to about \$1.3m in 2019, before dropping to \$456,000 in 2020.

The imports of flour, meal and powder of peas, beans, lentils and the other dried leguminous vegetables of heading HS 0713 (HS110610) were negligible before 2010 and started growing from \$137,000 in 2010 to \$565,000 in 2019 before dropping to \$284,000 in 2020.

In parallel, the imports of cereal flours (excluding wheat, meslin and maize) were around \$1m between 2009 and 2010, they peaked at \$1.2m in 2011 and ranged between \$500,000 and \$700,000 between 2015 and 2018 then reached \$606,000 in 2020.¹⁰

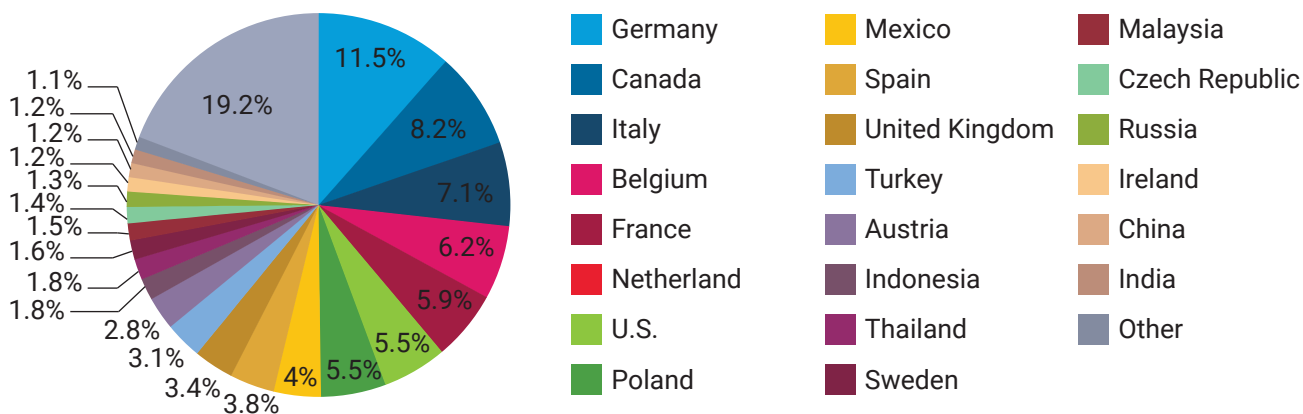
Overall, while Lebanon is still a net importer of products related to healthy snacks, the relatively large size of imports of these products highlights a significant demand for these products in the local market. Moreover, the economic and financial crisis made imported products less competitive in the local market, which was reflected by the drop in imports across all segments of healthy snacks, raising the prospects for local producers to grow in the local market and expand towards other international markets.

According to the ITC Export Potential Map, bread and pastry have an untapped export potential of \$6.2millions, sweet biscuits have an untapped export potential of \$7.1millions, waffles and wafers have an untapped export potential of \$2millions and rusks and toasted bread have an untapped export potential of \$1.1millions. Saudi Arabia, Syria and Iraq represent the greatest potential for exports of bread and pastry, as well as for sweet biscuits , waffles and wafers. Jordan is also a key destination for waffles and wafers. In terms of rusks and toasted bread, Kuwait, the UAE and Saudi Arabia show a large potential for exports of rusks and toasted bread from Lebanon.

The main exporters of products related to healthy snacks consisting of bread, pastry, cakes, biscuits or other (HS1905),as well as preparations from unroasted cereal flakes /mixes (HS190420), flour, meal and powder of pulses (HS110610) and cereal flours (excl. wheat/maize) (HS110290) are represented in the chart below.

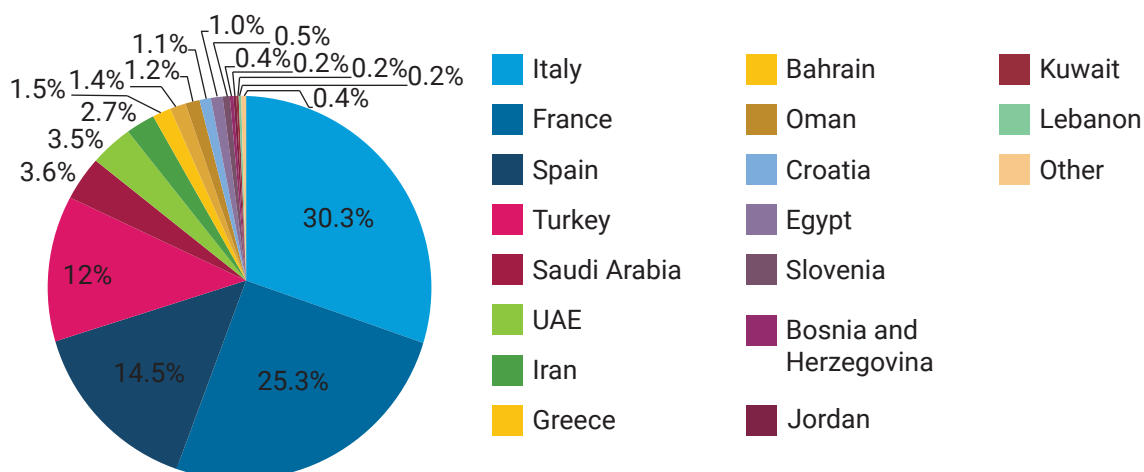
¹⁰ITC Trade Map

Figure 7: Main Exporters of Products Related to Healthy Snacks in % 2020



Source: ITC Trade Map

The main exporters in both the Mediterranean and Arab regions appear in the figure below:



Source: ITC Trade Map

III- Supply of Healthy Snacks in Lebanon

Given the current economic and financial challenges in Lebanon, several companies in the segment are trying to lower their operating costs in order to sustain in the market and keep their businesses alive. While the price of several locally sourced products declined due to the depreciation of the pound, some inputs that are imported, including foods and fuel witnessed a significant increase in prices in Lebanese pounds.

Currently, the three big cost centers that are relatively rigid are the transportation and power generation costs which depend on fuel and oil prices, as well as the wage bill, as companies try to retain as much as possible employees, and the imported raw material.

Several companies are trying to operate with a minimum margin in order to survive, making gradual increases in the price of their products in Lebanese pounds.

MEANS OF PRODUCTION

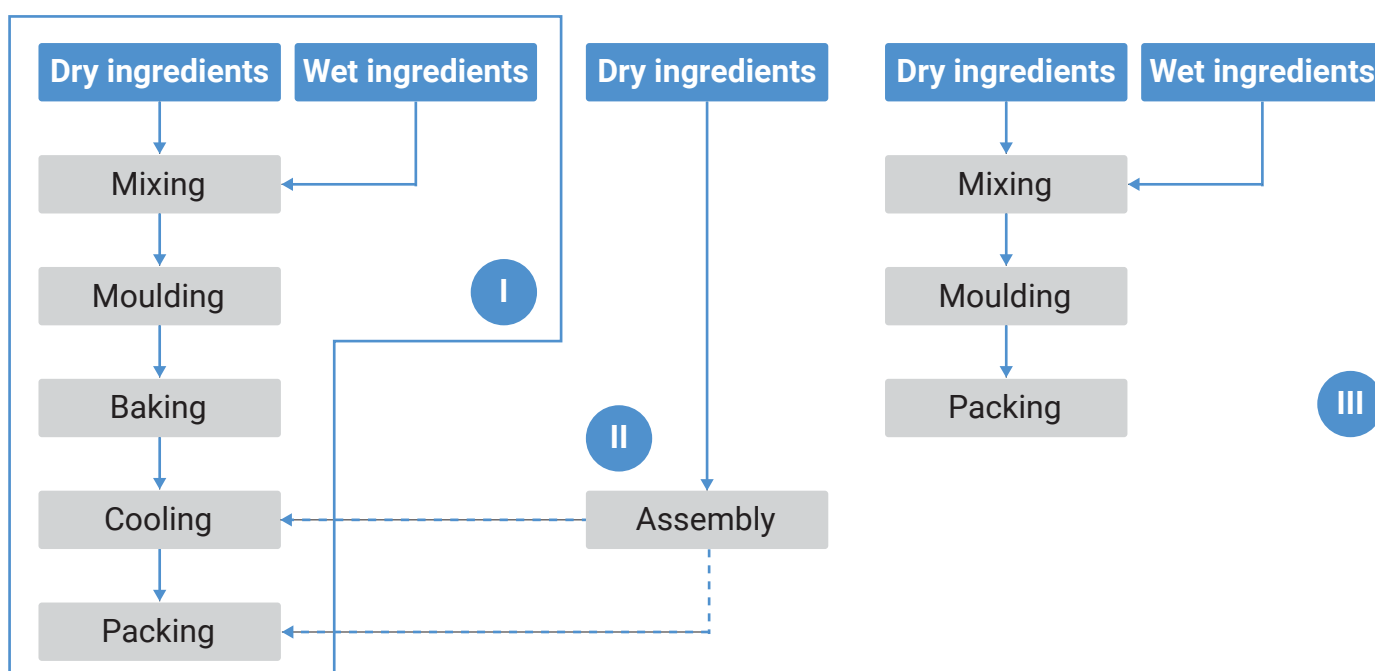
For several years now, there has been a substantial interest in fast food and snack food production, due to the changes in people's lifestyles. Numerous products are classified as "snacks," and in this category, mini-pizzas, cakes, popcorn, cereals, and cereal-based bars can be included.

Generally, snack bars are not recognized as functional foods, mainly due to their nutrient-poor composition. In the last years, there has been an interest in making new types of snack bars with functional components. Therefore, snack bars will be included in the functional product category and taking into consideration the consumer's acceptable and suitable ready-to-eat products.

The snack, cereal, and nutrition bars may be classified in three main categories: health and wellness snack, organic snack bars, and energy bars.

The simplified flowcharts of snack bar production processes are shown in Figure 8. For the baked bar products, dry and wet raw materials are mixed together. This mixture is portioned and subjected to baking.

Figure 8: Flowchart of snack bar production process
(I, baked bars; II, baked bars with filling; III, cold-formed snack bar).



The baking parameters (time and temperature) differ according to the specific characteristics of the finished product. For cold-formed bar production, the ingredients are also mixed together, and the resulting mixture is portioned in the desired shape without the baking step. For both types of snacks, there may also be additional operations, e.g., filling, coating with various glazes, drying, etc. Despite the bar type obtained, the final operation in the technological chart is packing.

The healthy bars are often made using a base of cereals such as oats, rice, corn, or proteins (milk dairy proteins, soy, or whey) and fortified with vitamins, minerals, and other nutrient- or energy-rich ingredients. Healthy Snack bars are not just popular for their portability but also for the health implications associated with their consumption. Trends in health and wellness in food and beverages have increased more and more in recent years, as consumers are turning to less processed and more natural alternatives than regular products.

Cereal bars are very adaptable products made from processed cereals mixed with a variety of ingredients depending on the target population group. Wheat and/or soy snack bars were designed as nutritional bars to provide the nutrients to consumers on the run. Walnuts were successfully used in the manufacture of snack bars with good nutritional (significant amount of raw fibers and lipids) and sensory quality.

In recent years, the demand for high-protein snack bars has grown significantly by the people engaged in sports activities and dieting or as meal substitutes. These snack bars provide a healthy alternative to conventional snacks due to its high content of protein (15–35%, w/w) and other nutritionally beneficial ingredients. In Table 1, different formulations for snack bars are shown.

Table 1: Several healthy snack bars formulation

Snack bar type	Formulation and Functionality
Fruit-based snack bar	Ingredients: Base: rice crisps, glucose syrup, honey, vegetable oil, quick-cook rolled oats (or natural apple dietary fibre or inulin), glycerol, whey protein concentrate, maltodextrin, pectin; Filling: pectin, sugar, citric acid, glucose syrup, honey, vegetable shortening, glycerol, and apple purée. Process: Base: the dry and wet ingredients are mixed, moulded and baked at 130°C/15 min; Filling: ingredients are heated with stirring to 84-86% soluble solids content; Assembly: the filing is placed between base parts Functionality: increased polyphenols and dietary fibre contents

Wheat- or soy-based bar	Ingredients: water, corn syrup, glycerine, brown sugar, Arabic gum, emulsifier, puffed wheat, wheat germ, commercial coatings, shortening, soy nuggets, soy protein, soy fibre, vanilla extract Process: ingredients (water, corn syrup, glycerine, brown sugar, Arabic gum, emulsifier, shortening, vanilla extract) are mixed and blended in different proportions to obtain wheat bar; wheat bar with coating; wheat and soy bar with coating; soy bar with coating; wheat bar with glycerine. The puffed wheat, wheat germ, soy nuggets, soy protein, soy fibre, are heated at 85°C/4 min. All the ingredients are mixed together and moulded. The bars are cooled at room temperature. Some bars are coated and cooled supplementary. Functionality: high quality proteins, fibres and B-complex vitamins contents
Cereal snack bar	Ingredients: corn starch biscuit (or marolo flour), skimmed milk powder, rice flakes, oat flakes, corn syrup Process: dry ingredients are mixed and then syrup is added. The bars are manually sealed, cooled for 8 h and then cut and packed in aluminium-coated cellophane Functionality: the marolo flour provided an increase in dietary fibre content, vitamin C, minerals, and antioxidant activity.
Fruit and vegetable-based snack bar	Ingredients: Sweet: fruit and vegetable flour, rice flour, oat flakes, linseeds, sucrose syrup, brown sugar, cocoa powder Salty: fruit and vegetable flour, rice flour, oat flakes, linseeds, egg white, olive oil, condiments Process: Sweet: the sucrose syrup heated is mixed with dry ingredients; Salty: ingredients are mixed, moulded into bars and baked at 160°/10 min, and reposed for 6h at room temperature until cold; Both types are coated in aluminized bags, sealed Functionality: high fibre, protein and mineral contents
Cereal snack bar	Ingredients: crushed corn starch biscuit (or jerivá flour), oat, skimmed milk powder, rice flakes, corn syrup Process: dry ingredients are mixed, adding the syrup (corn glucose and honey) and mixing. The mixture is plastic-coated and reposed for 8h, then moulded Functionality: increasing in total dietary fiber, vitamin C, mineral contents and antioxidant activity

Vegetable based snack bar	Ingredients: bean flour, oat flakes powder, water and soy lecithin Process: the ingredients were mixed, and the dough obtained is coated and cut to a standard size. The snacks are baked using convection oven at 120°C/30 min, cooled at room temperature and packed in metallic bags Functionality: increasing in protein and dietary fiber content and the antioxidant capacity
High-protein snack bar	Ingredients: milk protein, high fructose corn syrup and glycerol Process: the ingredients are mixed, and the mixture obtained is moulded into plastic cups. Functionality: increasing in protein content

The tendency to eat more nutritious foods instead of sweet products has led to the development of different snack bar types.

People who are interested in getting healthier foods and maintaining good body fitness have changed their eating habits, which have promoted growth in the cereal bar market of 20% per year. Therefore, healthy snack bars can be considered as a reliable source of high-quality proteins, fibers, vitamins, and minerals. The nutritive composition of selected snack bars is presented in Table 2.

Table 2. Chemical composition of selected snack bars made with cereal, fruits, nuts and/or chocolate

Nutrients	Unit/100g	1	2	3	4	5	6	7	8
Proteins	G	9.8	4.4	14.2	18.5	25	21.9	17.5	12.46
Lipids	G	17.6	7.5	3.1	13.2	10	10.8	17.5	14.82
Carbohydrates	G	66.7	72.9	69.6	55.1	53.	50.3	52.5	62.01
Total fibers	G	3.1	2.1	5.7	2.8	10	6.7	5	20.84
Minerals									
Calcium, Ca	Mg	60	41	504	953	625	754	15	~
Iron, Fe	Mg	3.18	4.9	11.7	14.7	10.1	16.3	5	~
Magnesium, Mg	Mg	101	27	248	255	175	317	0	~

Phosphorus, P	Mg	277	103	614	455	375	455	2.5	~
Potassium, K	Mg	326	197	362	~	300	351	~	~
Sodium, Na	Mg	251	167	308	418	255	383	125	~
Zinc, Zn	Mg	1.6	4.1	10	9.6	6.6	11.9	0	~
Vitamins									
Vitamin C, total ascorbic acid	Mg	1	0	92.3	144	75	490	0	~
Thiamine	Mg	0.28	1	8.06	2.7	1.9	29	0	~
Riboflavin	Mg	0.11	1.1	1.92	3.1	2.1	3.3	0	~
Niacin	Mg	1.75	13.5	32.6	36.4	25	45.2	0	~
Vitamin B-6	Mg	0.35	1.4	2.2	3.6	2.5	4.5	0	~
Folate, DFE	Mg	81	108	1046	727	500	816	0	~
Vitamin B-12	Mg	0	0	5.6	10.9	7.5	12.2	0	~
Vitamin E (alpha-tocopherol)	Mg	0.82	0.8	8.28	24.6	125	27.5	0	~
Moisture	G	4.1	14.5	9.8	8	9	14	~	6.8
Ash	G	1.8	0.8	3.3	3.1	3	3	~	3.89
Energy value	Kcal	464	377	363	406	402	386	450	347.9

This composition is valid for:

- Breakfast bars, oats, sugar, raisins, coconut (include granola bar)
- Breakfast bar, corn flake crust with fruit
- Formulated bar
- Power bar
- Chocolate bar
- Formulated bar Marathon multi grain crunch bar
- Formulated bar; protein performance bar, caramel nut rush
- Formulated bar, marathon energy bar
- Snack bar with soy
- Snack bars with beans and oat flour

From the compounds present in snack food, only a few, through their specific action, are essential to life and are usually known as biologically active compounds. These compounds are:

- Proteins
- Polyunsaturated fatty acids
- Vitamins
- Minerals
- Food fibers
- Probiotics

I- Equipment

Although people usually classify snacks into two groups (sweet and salty), these dietary products may also be categorized according to the food processing technique applied in their production. Thus, we can talk about three generations.

- The first-generation snacks produced by simple extrusion without further processing. Snacks like popcorn, nuts, dried fruit, or potato chips fall into the first-generation snacks group.
- The majority of snacks are second-generation products, meaning they are high-fiber, high-protein snack products made of extruded materials like puffed corn products, corn chips, curls, and balls.
- Third-generation snacks refer to fried and flavored snacks produced from extruded pellets, such as breakfast cereal. Snack pellets are non-expanded and made from raw materials like potatoes, cereals, and vegetable powder. Snack food manufacturers further process these semi-finished products to create ready-to-eat snacks.

Producing this type of snacks and bars is usually done by 6 steps:

1. Extrusion

This process happens in an extrusion cooker – a high-temperature, short-time, plug-flow bioreactor that combines various operations into one unit. The extrusion process involves:

- Continuous mixing of raw materials, like various grains with water
- Shearing or kneading
- Heating and cooking using the heat released in the extruder
- Puffing is the last stage in creating puffed snacks, and this is a sudden expansion of plasticized and gelatinized starch from a pressure chamber



Note

Compared to all other categories, the extruded snack category has the greatest potential for growth. Extruded snacks can be made in innovative ways that capture the consumer's imagination. The perfect examples of extruded snacks are three-dimensional snacks – alphabet, cartoon, animal shapes, etc. Manufacturing a successful extruded snack is a fine balance between the manufacturer's production abilities, quality control and economics, and consumer needs (like interests and tastes). What plays an important role in the product's selling price is raw material costs, so it's an advantage to use low-cost materials to manufacture a successful snack.

2. Co-Extrusion

Co-extrusion is a relatively new technology that was introduced in 1984 for this industry. In the co-extrusion process, two different materials get extruded from a single die, and they can come from one extruder and one pump or from two extruders. Using this process, snack food manufacturers can create a snack with two different textures, colors, or flavors. The most common snack food produced by this process is a cereal-based outer tube with a cheese filling.

On the market, you can find three types of co-extruded snack foods: cereal based tubes with a water-based filling, cereal-based tubes with a fat-based filling, and cereal-based tubes with a cereal-based filling. Due to the migration of oil and/or moisture from the filling to the outer shell, these snacks have a limited shelf life.



3. Expansion

This snack category is also called second-generation snacks or collet, and most extruded snack foods are in this category. Expanded snacks are low-calorie, high-protein, and high-fiber snack foods that are made on high-shear extruders. Some examples are potato sticks, onion rings, corn curls, and three-dimensional snacks. They can also be seasoned with various flavors, sugars, salt, oil, etc. The quality of expansion-manufactured snack foods depends on the raw material used in the formulation and the conditions of operation of the extruder. There are other factors that can affect the degree of puffing of snacks during the process, such as cereal particle size, dough residence time in the extruder barrel, and amount of moisture in the feed material.



4. Frying

The most familiar extruded snacks in today's snack market are fried collets which get their specific twisted puffed shape thanks to a special die arrangement. Fried collets are produced on collet extruders, then fried in vegetable oil and coated with a flavor. During the frying process, the level of moisture reduces from 8% to 2%. Snack producers may use continuous fryers for large-scale production (over 5000 lb/hour throughput), while batch fryers are convenient for the small-scale snack producers (less than 200 lb/hr). The material most commonly used for producing fried collet is corn meal.



5. Baking

Another example of the extruded expanded snack foods are baked collets (e.g., potato sticks, onion rings, and baked corn curls). They can be made with different tuber flours and cereal grains. Bran, cellulose, fibers, and protein can be blended with cereal grain (making up to 20% of the material) to make healthy snack foods. As for potato sticks, they are usually made by mixing potato flour with rice or corn flour. The baking process involves cooking snacks with heat transferred through the air by convection, conduction, or radiation. The effectiveness of each of these methods depends on the oven type and product design.

6. Drying

Certain products, like puffed snacks, become crispy through the drying process. These snacks need to be dried after the extrusion process, until the moisture level drops under 4%. This way, puffed snacks gain satisfactory texture and storage stability. Drying process control plays a significant role in ensuring that moisture does not go above or below the determined level.

Miscellaneous Equipment and Snack Food Technology

- Storage of equipment are essential for preserving raw material quality. Inadequate storage of natural materials used in snack production may seriously affect their quality.
- Measuring and weighing equipment provide data useful for process monitoring and feedback.
- Packaging should ensure that the finished product has a long shelf life. Also, process control needs to ensure that the packaged snack weight is close to the value specified on the package.
- Nut processing systems include various sorters, blanchers, roasters, and coolers.

New Process Equipment and Packaging Technologies That Meet the Market Demand

There is an increased demand for more nutritious food products, which drives the increased investment and innovation to create new products in terms of different forms, flavors, and tastes. Therefore, manufacturers of snack foods are implementing new technologies in snack production to meet these needs.

Vacuum Frying Technology

Frying technology has improved to enhance the nutritional values of processed and packaged snacks. For example, batch frying is a technique that produces snack foods with low fat and acrylamide levels. This is a potentially carcinogenic substance that appears when starchy raw materials fry at high temperatures for a long time. During the vacuum frying process, the frying vessel is enclosed, and the water temperature is below 100 C due to the reduced pressure. This way, ingredients are continually fried at low temperatures, preventing the appearance of acrylamide and the saturation of oil, resulting in a nutritious finished product.

Flexible Packaging Machines and Systems

Snack's packaging has shifted from share-size bags to single-portion packages. This change requires advanced packaging machines that provide flexible packaging materials, sizes, high speeds, and lower reject rates. By implementing these innovative systems, snack food companies will be able to implement better packaging materials and smaller sizes that comply with the Lebanese standards

II- Plant Facilities and Operating Requirements

Healthy snacks shall 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 5/1/2015 (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).

III- Packaging and Labeling

According to a 2015 Packaging World survey, 80% of brand owners agree that packaging influences brand value – and it is totally agreeable. How the packaging works and looks are the key to any successful sales strategy. That's why custom printed wrappers make an ideal packaging for food bars. Benefits of wrappers include:

- Packaging appeal
- Product security and freshness
- Portability
- Easy to open

Another cool thing about wrappers is that they can be printed on film, foil, or paper materials to best suit the product and packaging design.

Without prejudice to the requirements of NL 206 "General Standard for the Labelling of Prepackaged Foods", NL 661 "Guidelines for use of nutrition and health claims" and NL 658 "Labelling and claims for prepackaged foods for special dietary used, the following declarations shall be made:

- The name of the food: The designation "special dietary", "functional" or an appropriate equivalent term, may be used in conjunction with the name.
- Nutrition labelling

The declaration of nutrition information on the label shall include the following: (a) The amount of energy per 100 grammes or 100 ml of the food as sold and where appropriate per specified quantity of the food as suggested for consumption, expressed in kilocalories (kcal) and kilojoules (kJ).

(b) The number of grammes of protein, available carbohydrate, and fat per 100 grammes or 100 ml of the food as sold and where appropriate per specified quantity of the food as suggested for consumption.

(c) The total quantity of those specific nutrients or other components which provide the characterizing essential feature for the special dietary use for which the food is intended per 100 grammes or 100 ml of the food as sold and, where appropriate, per specified quantity of the food as suggested for consumption.

As for the labeling, according to NL 661 Guidelines for use of nutrition and health claims, calories are expressed for 100 ml or grams packages that must be equipped with a nutrition fact showing the following:

- Ingredients in descending order
- Calories
- Saturated Fat
- Cholesterol
- Sodium
- Sugars
- Protein
- Allergens
- Vitamins and minerals
- Fibers

INNOVATION

Reports have shown a high demand for innovative products with natural ingredients and without allergens. The proteins found in nutritional bars have typically consisted of whey, collagen, nuts or soy, but this list is expanding.

Nowadays plant proteins are showing up in multiple products and are considered as one of the most important innovations. Pea protein and seeds provide an option for consumers who might be allergic to nuts or soy.



Below are 2 ideas for healthy bars with plant-based proteins

Granola Bars with Dried Fruit and Seeds

Ingredients Makes 20 bars

Nonstick vegetable cooking spray

1 1/4 cups dried fruit (cherries, raisins, currants, cranberries, and/or blueberries), divided

2/3 cup honey

1/2 cup creamy almond, peanut, or sunflower butter

1 1/2 teaspoons ground cinnamon

3/4 teaspoon kosher salt

1 teaspoon vanilla extract

1 1/2 cups old-fashioned oats, divided

1/2 cup raw pumpkin seeds

1/2 cup raw sesame seeds

1/2 cup raw sunflower seeds

1/2 cup unsweetened coconut flakes

Step 1

Preheat oven to 163°C. Lightly coat a 13x9" pan with nonstick spray and line with parchment paper, leaving an overhang on both long sides; spray parchment.

Step 2

Pulse 3/4 cup fruit and 1/2 cup hot water in a food processor until smooth and incorporated, 3–4 minutes. Add honey, almond butter, cinnamon, salt, and vanilla and pulse until combined, about 15 seconds. Add 1/2 cup oats and pulse until well combined, 30–45 seconds. Add pumpkin seeds, sesame seeds, sunflower seeds, coconut, and remaining 1 cup oats and 1/2 cup fruit. Pulse until just combined, about 15 seconds.

Step 3

Transfer mixture to prepared pan, pressing down until completely even. Bake granola (for 35 minutes) until darkened, firm around the edges, and the center gives just slightly when pressed, . Transfer pan to a wire rack and let cool in pan. Remove granola using parchment overhang, then cut into 20 bars with a serrated knife.

Do Ahead

Step 4

Granola can be made 5 days ahead. Keep tightly wrapped at room temperature.

Cooks' Note

For crisp bars, arrange baked, sliced bars on a baking sheet and bake at 177°C (8 to 10 minutes) until golden brown, , or toast as desired in a toaster oven.

Protein Bars

Ingredients Makes 16 bars

- 1 cup cashews, raw and unsalted
- 1 cup almonds, raw and unsalted
- 1/2 cup dried cranberries or chocolate chips
- 2 1/4 cup dates (about 20)
- 3/4 cup rolled oats
- 1 tablespoon vanilla
- 1 tablespoon honey or agave



Step 1

Preheat oven to 170 degrees (or put the oven on its lowest setting and adjust the cooking time).

Step 2

Place the nuts in a bowl and cover with COOL water and soak for 1 hour.

Step 3

Cover the dates with HOT water and soak for 30 minutes. After soaking, drain off the water and pit the dates.

Step 4

Place the oats in a food processor and grind to a powder. Place in a separate large bowl.

Step 5

Drain the water off the nuts, place on a towel to remove excess water. Place the nuts in a food processor with the dried cranberries (chocolate chips) and pulse until nuts are in small pieces (the nuts will be uneven pieces which is fine. Just make sure they are all chopped).

Step 6

Place the nuts in the bowl with the oats.

Step 7

Place the dates, vanilla and honey (agave) in a food processor and pulse until it makes a puree. Place the date mixture with the oat mixture and thoroughly combine all the ingredients (mixture will be thick and sticky).

Step 8

Place the date nut mixture on a silpat on a cookie sheet. Spread out using a spatula or even your hands.

Step 9

Shape into a long rectangle about 1.2 cm thick and measuring about 594 x 841 mm. Make sure the rectangle is flat and even.*

Step 10

Bake for 4.5-5 hours or until the log is firm, but not hard (If the lowest setting on your oven is 200 degrees, cook for 4 hours).

Step 11

Cool, cut into bars and wrap individually.

Step 12

Note: If using a dehydrator, heat at 135 degrees and dehydrate for 6-8 hours

CONCLUSION

There has been a surge in snacking habits over the past two years, mainly driven by the measures related to the COVID-19 pandemic such as the implemented lockdowns, and work-from-home. The gradual increase in awareness about the quality of foods pushed consumers towards healthy snacks that fit within dietary objectives. There has been an increase in the consumption of “free from” snacks and reduced sugar, among other healthy alternatives. The global health and wellness snacks segment is expected to grow at a CAGR of 5.8% from 2020 to about \$98bn in 2025.¹¹ This provides room for additional supply and investments in the sector.

The healthy snacks segment grew significantly in Lebanon over the past 10 years. Specialty stores and several supermarkets have been offering more healthy snacks to buyers. Still, the majority of the most wanted snacks in Lebanon do not necessarily fall into the healthy category. As such, there is a need for increased awareness on the benefits of healthy snacks as well as competitive prices to compete with conventional snacks in the market.

On the international and regional levels, exports of Lebanese healthy snacks grew significantly between 2001 and 2020, and aimed to supply mostly the Arab region, specifically Iraq, Jordan, Saudi Arabia, the UAE and Kuwait. The Gulf Cooperation Council countries, as well as Syria and Iraq still provide Lebanon with a large untapped export potential for healthy snacks. Lebanon’s exports of pastry have a global untapped potential of \$6.2millions, sweet biscuits have an untapped export potential of \$7.1millions, waffles and wafers have an untapped export potential of \$2millions and rusks and toasted bread have an untapped export potential of \$1.1millions.

Still, Lebanon remains a net importer of healthy snacks, mainly from Turkey, the UAE, Saudi Arabia, Egypt, Syria and several countries in the EU, reflecting the demand for snacking in the local market. While the imported value of healthy snacks remained significant, it has been dropping substantially since 2018.

To gain competitiveness locally, Lebanese producers must explore new ways to reduce their costs, including substituting as much as possible expensive raw materials that are imported from abroad. Also, the renewable energy solutions and the efficient utilization of energy are required to reduce the energy bill.

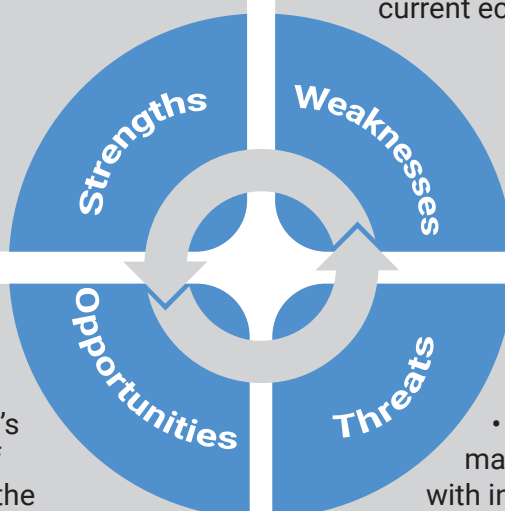
On the international level, innovative products and packaging need to attract new consumers across the Arab region. Producers must conduct market research to explore new markets while reducing their risks and potential failures at the same time. Introducing healthy snacks that include processed fruits and vegetables could provide producers with the opportunity to reduce their imports, as these are sourced locally, and create new innovative snacks with the ability to find their way to export markets.

¹¹The rise of the healthy snack, Nutraceutical Business Review

SWOT ANALYSIS

- Lebanon's location between markets with a relatively elevated purchasing power
- More shelves offerings such products at super markets
- Availability of a significant range of options to meet different preferences of healthy snacks
- Producers already have expertise in this segment, albeit they are a nascent and niche market
- New innovations easily provided

- Difficulty in buying imported inputs for producing healthy snacks
- Difficulty in keeping prices competitive in the local market due to the imported input
- Technical and quality requirements for production are not easily accessed by small producers due to lack of financing and expertise
- Low compliance with international standards among small producers
- Imported healthy snacks constitute a substantial share of the total local market
- Packaging, branding and marketing may not be a priority for producers given the current economic crisis and cost cutting



- Increasing local market share by substituting imported snacks
- Potential to increase Lebanon's exports especially to Arab Gulf Countries, given the change in the lifestyle of consumers in the Gulf
- Benefitting from the increase in snacking due to lockdown measures and the work-from-home environment taking advantage of the healthier lifestyle of a non-negligible portion of consumers after the COVID-19 pandemic
- Advantage of the current price competitiveness (decrease of LBP exchange rate to dollar) compared to other producing countries which in turn will increase Lebanon's exports
- Reducing costs by eliminating certain inputs, and focusing on organic, bio and free-from products
- Increased awareness about the importance of healthy snacks among Lebanese consumers

- Additional increase in the production costs due to financial and monetary crisis
- Loose access to international markets due to non compliance with international regulations, standards and technical requirements or due to other obstacles as economic sanctions
- Lose market share against competitors in the Mediterranean due to the repercussions of normalization on the regional level
- Lack of innovation due to cost cutting leading to more losses in competitiveness
- Eroding purchasing power in the local market, along with weak marketing and exporting to other markets to pressure SMEs in the segment, leading to more businesses closures

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