

# Pre-Feasibility Study

## Mouneh 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

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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 Mouneh 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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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) Oversight and coordination was done by Mr. Kjell Sundin (UNIDO Project Manager) and Ms. Nivine Chahni (Project Coordinator).

## DEFINITION

Mouneh is the practice of preserving food through various techniques (drying, pickling...etc.). This was common – even necessary – in the olden days due to the different seasons we had. Back then, the harsh cold seasons made fresh produce hard to come by. Thus, people had to find a way to make their spring and summer crops last through the winter to be able to survive.

The word Mouneh comes from the Arabic word mana, to store. In the past, especially in remote villages throughout Lebanon, Mouneh was prepared during the harvest, the season of abundance. Fruit, vegetables, herbs, plants and



all types of animal products were transformed into foods that could be safely kept for a certain period of time, usually a calendar year. Today, the world has changed considerably. This, of course, does not mean that it is a positive change when it comes to food products. Through varying growing techniques, which in some cases cause major harm to our planet, products are now available all year long. In Lebanon, some continue to preserve, even without the urgent necessity of yesteryears. Farmers can avoid waste by selling off some of their bountiful harvest products. Some people stock up on Mouneh to ensure food abundance in times of instability, while others maintain it as an important traditional aspect of our culinary heritage and feel the need to safeguard this family ritual.

The Mouneh falls into different categories. Jams, marmalades, molasses, syrups, and jellies, which are made to preserve fruits of the season. There are different techniques involved ranging from preserving whole fruit in syrup to developing highly concentrated liquids to making very thick molasses.

Vegetables are preserved in different ways. One way, involves the soaking of vegetables in a basic pickling solution made of water, salt, and vinegar. Highly reducing vegetables' water content to produce a thick paste is another alternative. Some vegetables are stuffed, and then preserved in extra virgin olive oil. Drying vegetables on a string in the sun was also a very common practice in the past. One of the most frequently used and important components of the Lebanese daily regime is the olive oil and Zaatar, therefore its widely common and in the tradition of each Lebanese family to secure its share of this product on a yearly basis. Olive oil is preserved in glass jars or in square-shaped stainless-steel containers away from light in a cool dry place.

Up until about the 1960's, in villages all around the country, a fat-tail sheep was force-fed for months before the cold winter. About mid-September, the sheep was slaughtered and its byproduct would ultimately feed a family for a whole year. The traditional recipe for meat preservation called Awarma calls for 1/3 meat and 2/3 fat. The fat is melted then the meat is added and cooked slowly over a low heat until it becomes tender.

Today, Awarma is still prepared, not so much for meat preservation, but for the exquisite and nostalgic taste that the recipe holds. It is very much appreciated in soups, pies, and is typically fried with eggs in a traditional fakhar, a curricular pottery recipient.

Dairy products are also an important feature in making one's Mouneh. In the past, lack of refrigeration made cow, goat, and sheep milk impossible to store. Thus, many recipes, which remain to be very popular and appreciated, were produced to preserve the abundance of milk. Different techniques including drying, preserving in oil, preserving in clay jars or in goatskin, and reduction have been created.

Grains, seeds, and nuts are also important part of the Mouneh. Grains are made into savory stews and are very much part of weekly meal menus. Seeds and nuts are common in Lebanese recipes and one favorite is the pine nut, which is harvested in the winter to be put on rooftops during hot summer days.

Distilling and owning an alembic is typical of the Mouneh producer. The most traditional recipes include distilling orange blossoms in April, rose petals in May, wild plants throughout the year, and fermented grapes at the end of the summer to make our national drink "Arak".

The Mouneh is essential to preserve nature's abundance according to each season, naturally. This is why it is worth exploring. The tables below show a sample of how different inputs are used in Mouneh products and can be divided onto the different seasons of the year.

Season	Winter	
	December	January
Mouneh Products	Mandarin	Carrots
	Bitter orange	Turnips
	Lemon	Grapefruits

Season	Spring		
	March	April	May
Mouneh Products	Cucumber	Honey	Artichokes
	Cabbage	Blossoms	Crabapples
	Cauliflower	Strawberries	Damascus Rose
	Eryngo	Peas	Garlic
	Green Thyme	Sea fennel	Green Unripe Walnuts
	Green Unripe Plums	Jam	Roasted Green Wheat
	Akub	Fruit Syrups	
	Gundelia tumbleweed	Marmalades	

Season	Summer		
	June	July	August
Mouneh Products	Dried fruits & vegetables	Bell Peppers	Basil
	Apricots	Cucumbers	
	Capers	Corn	Green Hot Peppers
	Cherries	Green Cherry Tomato	
	Chickpeas	Green Beans	Lentils
	Fava Beans	Green Tomatoes	
	Grape Leaves	Green Unripe Grapes	Okra
	Mint	Melon	
	Onions	Plums	Peaches
	Pine nuts	Sage	
	Pine Cones	Salt	Sesame seeds
	Watermelon	Wheat	
	Wild Flower	Wild Cucumbers	Sumac
	Wild Thyme	Zucchini	
	Mulberries	Sun-dried Tomatoes	



Season	Autumn		
	September	October	November
Mouneh Products	Apples	Bay leaves	Beetroot
	Beans	Black Olives	
	Carob	Dates	Grapes
	Eggplant	Grapes	
	Figs	Myrtle	Quince
	Green Olives	Pears	
	Raisins	Pomegranates	Pumpkins
	Red Peppers	Tomatoes	
	Walnuts		
	Meat Preservation		

Depending on the product, there are different ways to make provisions. The most common ways are:

- **Drying:** is one of the most common methods used for preserving food, not only in Lebanon, but also in the entire Arab World. Most notably in rural houses, wicker baskets and trays hanging on the front porches or the roofs with produce ranging from fruits to herbs to grains (and even meat) is a common summertime sight.

**Products including (but not limited to):** Red Pepper – Raisins – Walnuts – Figs – Dates – Tomatoes – Peas – Zaatar – Sumac and Lentils.

- **Pickling:** Another way of preserving foods is pickling, the most common way being with the use of vinegar, or water.

**Products including (but not limited to):** Cucumbers – Onions – Carrots – Cauliflower - Chili peppers – Turnip – Beetroot and Eggplant.

- **Preserves:** Another common summertime sight is large pots of mashed produce boiling over wood-fire, making all sorts of jams, jellies and pastes.

**Products including (but not limited to):** fruits such as Apricots – Figs – Strawberries – Peaches - Apples as well as some vegetables such as Tomatoes and Chili peppers.

- **Oil-Packing:** This process is very similar to pickling, with oil instead of vinegar. The most common items include dried labneh, dried Kishk balls and Eggplants (makdous). Some mouneh items are made in different ways. For instance, meat preserves (also known as awarma) is made by rendering the fat of the animal, then slowly cooking the minced meat and storing it (with very large amounts of rendered fat) in a jar. The meat preserves would then be added to hot stews and dishes during the winter.
- **Kishk:** The name “Kishk” originates from the Persian word “kashk”, referring to a mix of cracked wheat and cracked Barley. Characterized as a fermented milk product, “kishk” is made of bourghul – cracked parboiled wheat – mixed with either milk or yogurt. A common food in Lebanon, Syria, Palestine and Turkey, “Kishk” season starts in the summer, when milk production is at its best and sun heat is at its peak. Cracked wheat is soaked in milk or yogurt for almost a week and fermentation is kept under control by adding small amounts of dairy products every few days. After cracked wheat is soaked in the dairy products and fermentation reaches the right degree, the pre-final product is an edible dough named “kishk akhdar” or “green kishk”. At this stage, this type of “kishk” can be formed into small balls that are conserved in olive oil for consumption in wintertime. To get to the final “kishk” product, the dough is spread onto clean white sheets, on village rooftops, for the heat of the summer to dry it rock hard. Once totally dry, “kishk” is gently rubbed to obtain a fine, off-white powder, and winter’s most nutritious preserve.
- **Milling of grains (i.e bourghul):** Bourghul is very easily confused with cracked wheat, especially by appearance, although unlike bourghul, cracked wheat is usually crushed wheat grain that has not been parboiled. Bourghul is a common ingredient in cuisines of many countries of the West Asian cuisine and Mediterranean Basin. Bourghul is available in different grinds, ranging from fine to medium, coarse and extra coarse. Some recipes call for a specific grind. Bourghul does not require cooking, although it can be included in cooked dishes. Soaking bourghul in water is all that is required. Coarse bourghul is used to make pottages while the medium and fine grains are used for breakfast cereals, salads and breads. Bourghul is a main ingredient in many traditional Lebanese dishes such as Kebbeh and the famous Tabouleh salad.

## MACRO TRENDS

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### I- Global, regional and local importance of “Mouneh” products

Despite being a characteristic of Lebanese traditions, “Mouneh” products are increasingly demanded in foreign markets due to the expanding Lebanese Diaspora, as well as Arab communities abroad, which keep such products within their diets and help raise awareness of the benefits, quality and the taste of the “Mouneh”.

Further, the Lebanese diet became the essence of the Mediterranean diet, as Lebanese brought foods of other culture into their diet, and Mediterranean foreign powers that historically influenced Lebanon also brought in significant parts of their cuisines. In parallel, “Mouneh” is the building block of Lebanese culinary heritage<sup>1</sup>, which shows how these products blend perfectly within the Mediterranean diet, named as best diet for 2022.<sup>2</sup>

As consumers are becoming healthier and more aware about the environment, “Mouneh” products are increasingly being demanded as a large portion of the offered bundle of products tends to be healthy, and given that the idea behind “Mouneh” is to preserve highly perishable food.

Most successful cooperatives in Lebanon mainly produce “Mouneh” as it gains value through perceived authenticity and rurality as well as from the social value it provides by empowering women in rural areas. In addition, donor-funded programmes concentrate significantly on supporting “mouneh” production given their wide export potential.<sup>3</sup>

The local demand for “Mouneh” products also increased, especially jams, rose water, thyme, pickles, labneh, keshk, among others, despite the current economic crisis. Mainly because locally produced products are becoming more competitive due to the drop in the purchasing power. In this context, a large segment of Lebanese consumers has shifted from buying imported products to the local market.<sup>4</sup>

Lebanese “Mouneh” producers, especially those who still follow traditional and authentic ways of production, benefit from a market drive from Lebanese citizens who mainly retain a significant importance for traditional food, consuming two traditional meals per day on average. The Lebanese diaspora, with its large size, remains a main growth potential for this specific segment, as Lebanese consumers abroad continue to demand locally produced “mouneh” products.<sup>5</sup>

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<sup>1</sup>Overview on local agriculture and food heritage: case of West Bekaa and Shouf in Lebanon, MedSNAIL

<sup>2</sup>Mediterranean diet named best diet for 2022, CNN

<sup>3</sup>Exploring Alternative Food Initiatives in Lebanon, Jibal

<sup>4</sup>Economic crisis led to rediscover traditional food, SBI

<sup>5</sup>An Introduction to Food Cooperatives in the Bekaa Valley, Lebanon: Territorial Actors and Potential Levers to Local Development Through Culinary Heritage, HAL open science

Given the current deteriorating economic environment and the financial crisis in Lebanon, “Mouneh” products and locally produced foods have a potential to support rural economies as they benefit the whole value chain, starting with agriculture products and their processing, and could fill the gaps related to food security and gender-related issues.<sup>6</sup>

Cooperatives are a main producer of “Mouneh” products, and still follow traditional methods of production. The Bekaa region is a hub for the making of such products, and Kishk is one of the top produced “Mouneh” products by cooperatives.<sup>7</sup>

## II- Trade Performance

As “Mouneh” represents a bundle of preserved or ready-to-eat products, monitoring the trade performance of these products requires a look over several HS code classifications. Some of the products fall under (HS 20) preparations of vegetables, fruits and nuts or vegetable-based preparations and ready and semi-ready-to-eat meals (HS 21), excluding in our study preserved dairy and meat products.

Under HS 20, the most commonly known products that are related to “Mouneh” include:

- HS 2001 Vegetables, fruit, nuts and other edible parts of plants, prepared or preserved by vinegar or acetic acid.
- HS 2002 Tomatoes prepared or preserved otherwise than by vinegar or acetic acid.
- HS 2003 Mushrooms and truffles, prepared or preserved otherwise than by vinegar or acetic acid.
- HS 2004 Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, frozen, other than products of heading No. 20.06.
- HS 2005 Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, not frozen, other than products of heading No. 20.06.
- HS 2007 Jams, fruit jellies, marmalades, fruit or nut purée and fruit or nut pastes, obtained by cooking, whether or not containing added sugar or other sweetening matter.
- HS 2008 Fruit, nuts and other edible parts of plants, otherwise prepared or preserved, whether or not containing added sugar or other sweetening matter or spirit, not elsewhere specified or included.

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<sup>6</sup>An Introduction to Food Cooperatives in the Bekaa Valley, Lebanon: Territorial Actors and Potential Levers to Local Development Through Culinary Heritage, HAL open science

<sup>7</sup>An Introduction to Food Cooperatives in the Bekaa Valley, Lebanon: Territorial Actors and Potential Levers to Local Development Through Culinary Heritage, HAL open science

Under HS 21, “Mouneh” products mostly fall under:

- HS 2103 Sauces and preparations thereof; mixed condiments and mixed seasonings; mustard) flour and meal and prepared mustard
  - HS 2103.90.30 Sauces and preparations thereof, mixed condiments and mixed seasonings (excl. soya sauce, tomato ketchup and other tomato sauces, liquid mango chutney and aromatic bitters of subheading 21.03.90.30)
- HS 2106 Food preparations not elsewhere specified (all kinds of food mixes including instant food mixes, soft drink concentrates, Sharbat, Betel nut product known as "Supari", Sterilized or pasteurized millstone, ready to eat packaged food and milk containing edible nuts with sugar or other ingredients)
  - HS 21069090 Other (322)
  - HS 21069030 Mixtures of thymes and other edible products

There are also other products such as HS 0409 Natural honey. Other products also include preserved labneh under dairy, as well as “awarma” or meat preserves, which are still nascent in terms of export volumes. However, the included products under the trade chapter are those with clear HS codes.

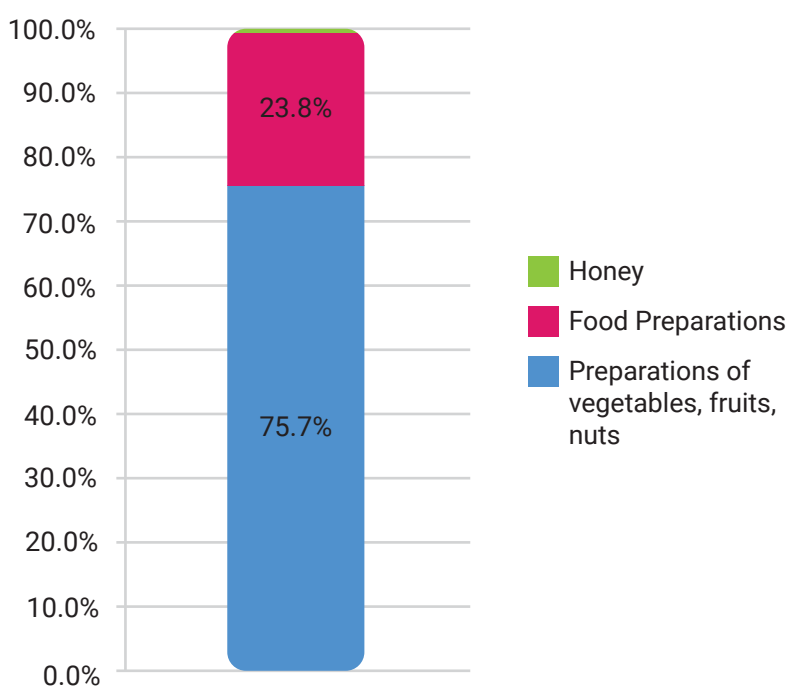
The exports of traditional Lebanese food and “Mouneh” as reflected by the abovementioned HS codes grew by an estimated CAGR of 11% between 2001 and 2020, totaled about \$160m. The exported value should not be taken as an exact reference for Mouneh products, as it includes some other products that are difficult to exclude due to the obstacles related to the broad classification of the Harmonized System. Still the growth rate could provide an indication on the trend and the demand of these products, mostly composed of Mouneh or Mouneh-related products, abroad.

- Products under HS code 2008 fruit, nuts and other edible parts of plants, prepared or preserved, otherwise prepared or preserved, whether or not containing added sugar or other sweetening matter or spirit, under the category “Fruits and nuts preparations represent around 30% of the total exported products under the selected HS codes above, even though a large portion is actually nuts.
- Products under HS code 2005 labeled as other vegetables prepared or preserved otherwise than by vinegar or acetic acid, not frozen, represent about 22% of total exported products under the selected HS codes above in 2020.
- The sauces and mixed seasonings (HS code 2103), which include multiple components of “Mouneh” products constitute about 13% of the exports of this segment.
- The exports of pickled products under HS code 2001 represent about 12% of the segment, than jams, fruits jellies, marmalades, and fruit purée and pastes (HS code 2007), as well as food preparations (HS code 2106) constitute around 11%, each, of the segment.
- Also, tomatoes prepared or preserved otherwise than by vinegar or acetic acid, as well as frozen vegetables and honey accounted for 1% each.

Food preparations (HS code 2106) include several items that are not considered as “Mouneh”. However, those that fit mostly under traditional Lebanese food are HS 21069090 Other (322) as per the Lebanese Customs, as well as 21069030 Mixtures of thymes and other edible products. These two components represented 67% and 9%, respectively, of food preparations (HS code 2106) in 2020.

It is worth mentioning that recently there was a new pending application for the entry of honey from Lebanon to the European Union, which is currently being examined by the competent authorities in Brussels. Companies that are looking to export honey to the EU can contact the economic attaché in the Embassy of Lebanon in Brussels, Mr. Saadallah Zaiter to support them in the needed documentation to export honey to the EU. Other products of animal origin cannot enter the EU given that the competent Lebanese authorities have to make a specific application and fulfill certain requirements, such as a credible residue monitoring plan.

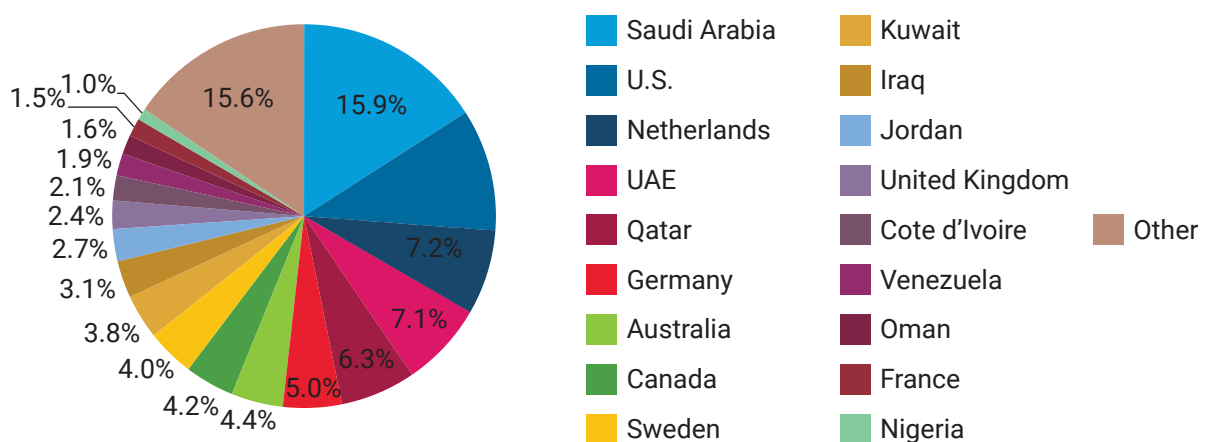
**Figure 1: Share of exported products labeled under Mouneh or traditional Lebanese food in 2020**



Source: ITC Trade Map

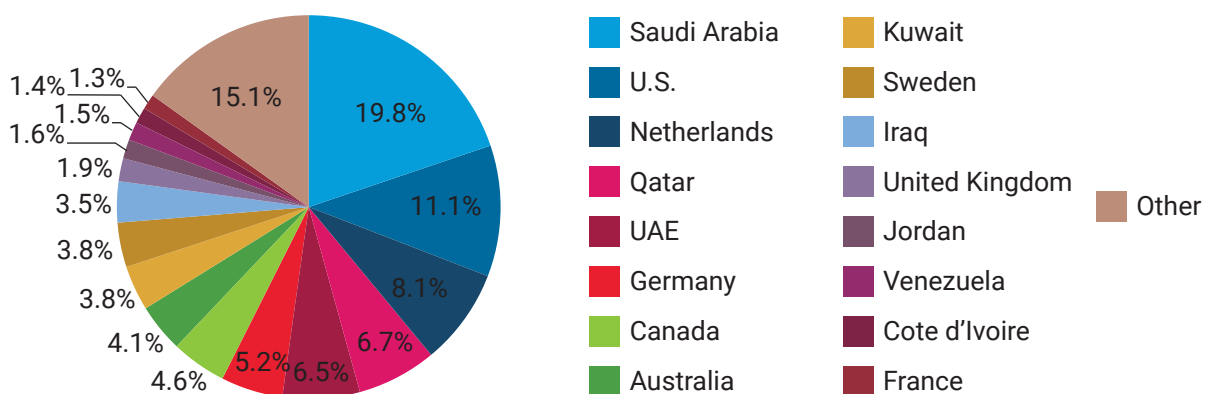
The main destinations of exported products under HS 20 preparations of vegetables, fruit, nuts or other parts of plants, as well as under HS 21 are represented in the below charts. While HS 20 and HS 21 include some products that are not part of the “Mouneh” segment, these chapters could provide an overview about the possible destination for Mouneh products as well as Lebanese traditional ready-to-eat meals.

**Figure 2: Destinations of exported products under preparations of vegetables, fruits and nuts (HS20), Food preparations (HS21) and honey (HS0409)**



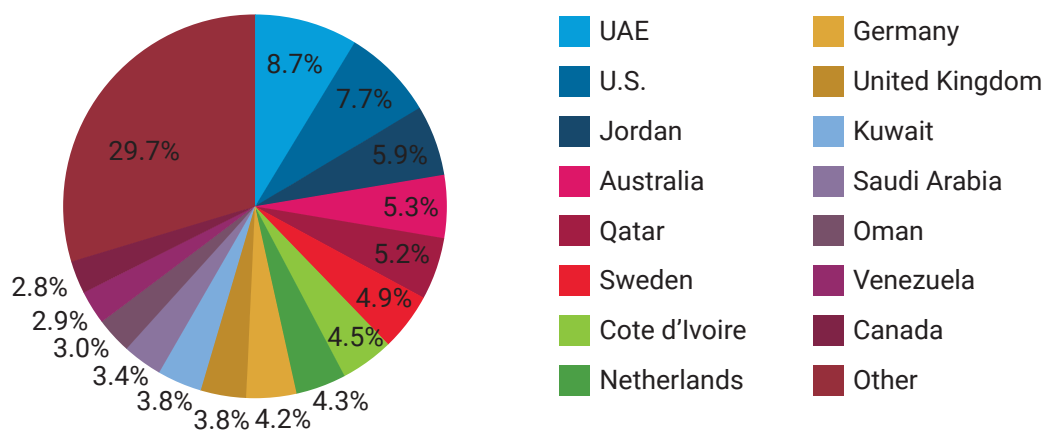
Source: ITC Trade Map

**Figure 3: Main destination for HS 20 products in 2020**



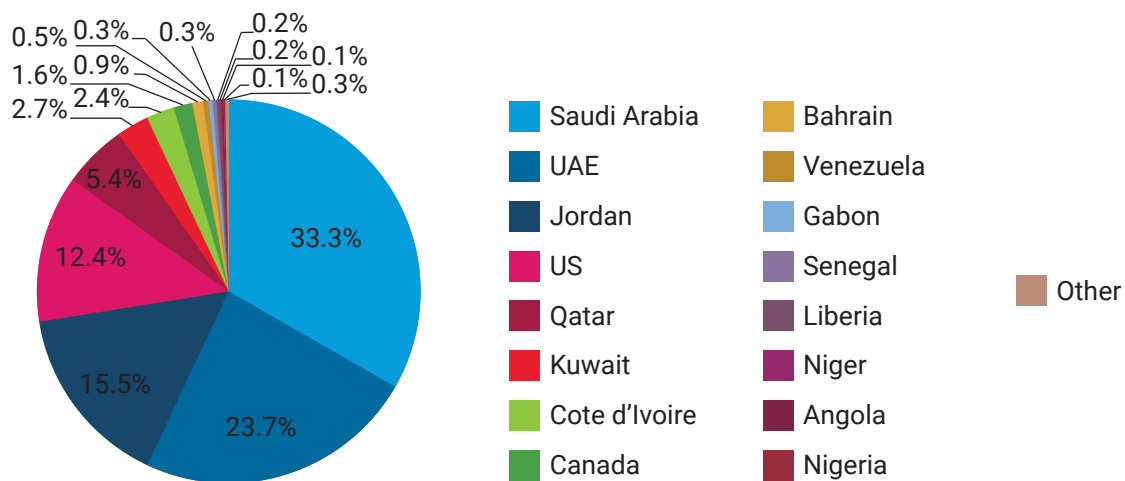
Source: ITC Trade Map

**Figure 4: Main destination for HS 21 products in 2020**



Source: ITC Trade Map

**Figure 5: Main destination for exports of honey in 2020**



Source: ITC Trade Map



In parallel, imports of products having the above-mentioned HS codes grew by a CAGR of 2% between 2001 and 2020 to about \$123m in 2020.

The largest component of these imports are food preparations (HS 2106) accounting for 56% of total imports. However, only 65.9% of food preparations (HS 2106) may be actual food that represents or substitutes “Mouneh” products in Lebanon. The second largest component is the preparations of vegetables, fruits and nuts under the classifications HS2005 (**Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, not frozen, other than products of heading No. 20.06.**), HS2002 (tomato-based products), HS2007 (**Jams, fruit jellies, marmalades, fruit or nut purée and fruit or nut pastes obtained by cooking, whether or not containing added sugar or other sweetening matter**), HS2008 (**Fruit, nuts and other edible parts of plants, otherwise prepared or preserved, whether or not containing added sugar or other sweetening matter or spirit, not elsewhere specified or included**), HS2003 (**Mushrooms and truffles, prepared or preserved otherwise than by vinegar or acetic acid.**), HS2004 (**Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, frozen, other than products of heading No. 20.06.**), HS2001 (**vegetables, fruit, nuts, and other edible parts of plants prepared or preserved by vinegar or acetic acid**), and HS2006 (**Vegetables, fruit, nuts, fruit-peel and other parts of plants, preserved by sugar** (drained, glacé or crystallized, at 32%, then condiments and sauces (HS2103) with 11% and honey with 0.7%.

Overall, Lebanon is a net exporter of products in this segment, especially in terms of prepared or preserved fruits and nuts (HS2008), as well as other vegetables prepared or preserved otherwise than by vinegar or acetic acid (HS2005), pickled products (HS2001), jams, fruit pure, marmalades, fruit jellies (HS2007), sauces and mixed condiments (HS2103). Lebanon is still a net importer of food preparations n.e.s (other), which may actually include some ready-to-eat meals that are not necessarily “mouneh” related. However, Lebanon’s position as a net importer in this specific segment has been narrowing, as locally produced products are replacing imported foods, especially after the financial crisis as Lebanese products are gaining competitiveness.

According to the ITC Export Potential Map, products that are related to Mouneh products with a large export potential are:

- Nuts and other seeds, prepared or preserved (not elsewhere specified), including mixtures, HS 200819) have an untapped export potential of \$11m
- Food preparations (HS210690) have an untapped export potential of \$13m
- Vegetables n.e.s & mixtures, prepared or preserved, not in vinegar, not frozen (HS 2005) have an untapped export potential of \$8m

- Preparation for sauces, mixed condiments, mixed seasoning (HS 210390) have an untapped export potential of \$8.7m; tomato sauces and ketchup (HS 210320) have an untapped potential of \$2.1m (However ketchup is not part of Mounneh products)
- Vegetables preserved in vinegar or acetic acid, other (HS 200190) have an untapped export potential of \$6m; pickled cucumbers and gherkins (HS 200110) have an untapped potential of \$1.2m
- Jams, fruit jellies, purees and pastes, excluding citrus (HS 200799) have an untapped export potential of \$5.3m

### **Local Production of Mounneh products in Lebanon**

In addition to cooperatives, there are more than 300 companies registered at the Ministry of Industry involved in the production of specific products that fall under the mounneh segment. Many of these companies produce several products of the segment simultaneously. About 65% of these companies produce dairy products, around 17% produce pickles, 14% are into the production of jams, around 5% of companies produce dried vegetables and fruits, 5% are also producers of molasses (known as “dibs”), about 4% are into thymes production, and a lower number of companies produce honey and some produce ready-to-eat meals.

It should be noted that not all producers of dairy products can be considered as mounneh products, as the mounneh segment is only related to preserved types of dairy products.

### **Neighboring countries with large exports of Mounneh**

While Mounneh production is a Lebanese tradition, monitoring the exports of HS 20 and HS 21 from neighboring countries can provide an indication on the trade flows of similar products in the region. The large exporters of products under HS 20 preparations of vegetables, fruits and nuts in 2020 among Mediterranean and Arab countries are Italy, Spain, Turkey, France, Greece, Egypt, Saudi Arabia and the UAE.

The large exporters of products under HS210690 (Food preparations n.e.s) in the same region are France, Italy, Spain, Turkey, Greece, Egypt and Jordan.

In terms of products sold or exported and entitled as “Mounneh” products, Syria, Palestine, Iraq and Jordan are main exporters of products of this same segment, and therefore they represent the main competition for Lebanese exporters of “mounneh” products.

As such, Lebanese producers who are willing to export some of their “mounneh” products abroad can assess the competition and their products, and check the main destination of the aforementioned countries, in order to check which products can compete in these markets, as well as to find an effective branding for their products.

# MEANS OF PRODUCTION

## I- Average Cost Breakdown

The average cost breakdown of companies producing “mouneh” products varies across the produced items as well as the ways of production and the firms’ size.

On average, the cost of raw materials varies around 30% of total costs. The cost of electricity and transportation varies between 35% and 50%; transportation and electricity costs increased significantly due to the global increase in the price of hydrocarbons as well as the removal of subsidies in Lebanon and the depreciation of the Lebanese pound, as fuel is imported. Management and labor costs fluctuate between 20% and 30%, depending on the number of employees, which is also a function of the quantity produced and the variety of items, as well as the multiple distribution channels used and the existence of export activities. In nominal terms, salaries have been increasing to cope with the financial and economic crisis and the depreciation of the Lebanese pound.<sup>8</sup>

Companies are trying to lower their expenses and are operating with lower margins to remain in the market, as the purchasing power of consumers in Lebanon has been impacted by the crisis. In addition, some companies are developing online platforms to cope with COVID-19 related restrictions and lower fees. Also, companies are increasingly trying to expand their export activities to ensure a steady inflow of foreign currency and limit the risk related to the depreciation of the Lebanese lira.

## II. Technical Requirements

### I. Mouneh Composition

The following inputs constitute the raw material to produce a wide variety of Mouneh products. In Lebanon the most commonly consumed products can be summarized by the following list:

- Freekeh
- Saffron
- Jams- apricot, strawberry, pumpkin (with pieces),
- Preserves- bitter orange peel, apples
- Pickles
- Oil-preserved foods- Makdous
- Herbs- Za’atar
- Syrups
- Distilleries



<sup>8</sup>The costs were estimated during meetings conducted with three different “mouneh” companies in Lebanon

- Sun-dried fruits
- Compotes
- Dairy- Labneh
- Hot sauces
- Pomegranate and carob molasses
- Sour grapes
- Crackers & cookies
- Sweets- sesame candy
- Bourghol
- Shanklish

### Summertime Affair

Mouneh was initially a way of preserving produce and crops, which are mostly in season during spring and summer. Thus, Mouneh-making mainly takes place starting late spring until the end of summer, with some Mouneh being made in the fall. Keeping in mind that some preserves are made during winter, and some all-year-round, here is a general breakdown of the Mouneh making timeline:

- Spring: Making Mouneh usually begins in late April – early May, where some jams are made (strawberry, for instance).
- Summer: Most Mouneh is made during the summer, since most food is in season during this period. Also, the weather conditions are optimal for some processes such as sun-drying. Some examples of Mouneh during this time include: apricot jam in June, peach jam in July, Zaatar starting in July, kishk starting mid-August until September, and eggplant makdous starting mid-August; however, some claim that the makdous made in the last week of September is always the best batch of the year.
- Autumn: The most important Mouneh item made in the fall is olive oil, which is arguably one of the most important ingredients in the entire Lebanese food culture. Harvest begins after the first rain of October and olive oil production could last until mid-November.

### Local Specialties

Though most Mouneh is made everywhere in Lebanon, some regions shine brighter with their Mouneh variety. Here are a few regions in Lebanon where the Mouneh is most famous for making:

- Baalbeck: Eggplant makdous, kishk, apricot preserves, goat labneh.
- Byblos: Rose water, pomegranate molasses, verjuice, apple vinegar, apple preserves, kishk.
- Hammana: Cherry based foods.



- Kesserwan: Cheese, notably goat cheese.
- North Lebanon: Olive oil, sumac, zaatar.
- South Lebanon: Burgul, zhourat, freekeh, zaatar, sesame, orange blossom water.

Making Mouneh was originally a way to make food last longer and, more importantly, to have food around for the times of the year when nature isn't as giving. Nowadays, modern technology has developed ways for us to have produce all-year-round. However, that hasn't stopped these products from becoming a tradition and part of the culture. People have acquired a taste for the Mouneh product itself, rather than the original produce it preserves, which gave the advantage to these products and kept their high demand in the market.

## ii. Machinery Needed

Several types of equipment are used in the production of Mouneh products depending on the inputs and the end product, the following list highlights the most used equipment for Mouneh products:

1. Grinder
2. Mixer
3. Peeler
4. Distiller
5. Mill
6. Cooker

### 1. Grinder

To grind means to reduce hard foods, such as nuts or spices, into fine particles using a pestle and mortar, grinder or blender. Grinding changes the texture and also releases the flavor.

### 2. Mixer

The process of combining two or more separate components to produce a certain level of homogeneity.

### 3. Peeler

The objective of peeling is to remove the skin/peel from raw fruit and vegetables. This improves the appearance and taste of the final product. During peeling, the losses need to be minimized by removing as little of the underlying food as possible but still achieving a clean peeled surface

### 4. Distiller

Distillation is a separation process, separating components in a mixture by making use of the fact that some components vaporize more readily than others. Major uses of distillation in the food industry are for concentrating essential oils, flavors and alcoholic beverages, and in the deodorization of fats and oils.

## 5. Mill

Milling is a process in which grains are milled to create food products ranging from powder such as flour to liquids such as olive oil.

## 6. Cooker

A cooker is a metal oven and hot plate that you use for boiling, grilling, or roasting food. Cookers are used to produce pot roast, stews, soups, "boiled" food, including dips, desserts and beverages. There are three types of cookers: gas, electric and dual fuel, which combine a gas hob and an electric oven.

### iii. Labelling and Storage

#### Storage:

- Never store your Mouneh in plastic containers. Always use glass, especially if you're making something hot like jam.
- Make sure your containers are sterile. To sterilize your jars, boil them upside down and leave them to dry out in the sun. Make sure not to touch the inside after you boil them. Back in the day, jars were covered at the top with wax before they were closed to keep the food completely airtight.
- Always store your Mouneh away from the sunlight.
- After you open it for the first time, a jar typically lasts 15 days at room temperature and around 3 months in the fridge.
- When it comes to oil-packed Mouneh, make sure whatever is stored inside is completely submerged in olive oil at all times. If the oil level goes down after taking a few pieces of the product and exposes the product to air, simply fill the container with more olive oil.

#### Labeling:

Customers and consumers expect the labelling on food to be a true description of what they are buying.

Misleading or fraudulent labelling is an unfair trade practice that cannot be tolerated. Most countries now have labelling laws stipulating how foods are to be labelled and what information labels must contain. Most, if not all of those laws have in common requirement that the label should bear:

- The name and address of the manufacturer, packer, distributor or consigner
- Statement of identity and a true, non-misleading description of the product: the name of the product shall include the indication of the packing medium and the presentation style

- Declaration of net and drained weight in international units.
- List of ingredients (in descending order of volume or weight).
- List of food additives and related warnings and precautions.
- Storage instructions.
- Batch number, otherwise production date.
- The country of origin.
- Production date and expiry date.
- Nutritional qualities or values of the food.

Consignments of exported food to foreign markets are often denied entry because the labelling does not comply with the mandatory requirements of the importing country.

This sometimes results in consignments being rejected, but more often in them being withheld from entry until the labelling is corrected or a new labelling is used. In either case, trade is interrupted, which could raise costs and make sales unprofitable. It is essential therefore, that exporters be familiar with the food labelling requirements of importing countries.

The labelling requirements for the Lebanese markets can be found at LIBNOR under the mandatory standard **NL 206:2017** and its amendments (General Standard for the Labelling of Prepackaged Foods)

#### PLANT FACILITIES AND OPERATING REQUIREMENTS

Mouneh products 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 Decision of Minister of Industry 1/1 dated on 5/1/2015 (General requirements in food processing establishments) decision of Minister of Industry 84/1 dated on 30/11/2021 (Food industries must adhere to Good Manufacturing Practices and Lebanese Standards)

## INNOVATION

Innovation in the food industry combines technological innovation with social and cultural innovation. Therefore, innovation represents a huge part of the Mouneh products where each village in Lebanon excels in a specialty that is directly linked to the culture of the region and is passed throughout the generations which held within its components a local ingredient or a specific method of preparation that is only applicable in the region (usually linked to the environmental factors such as temperature or humidity).

That being said the following section will highlight some of the Mouneh products specialties of several regions in Lebanon.

- **Rose Petal Jam (Chouf Area)**

Rose petal jam is a specialty for the Chouf region in Lebanon, where roses are one of the most planted and nurtured plants in the area, furthermore the environmental conditions in this region are adequate for these plants to grow and thrive. Rose petal jam is used mainly in pastry. It adds a sweet taste to your cake and biscuits. *Rosa damascena* petals are gathered in the morning before they start to fade. They are washed to remove debris, soil or dust, then they are air-dried. Petals are separated, pollen grains are removed through a filter net – this will also remove other “impurities” – then petals are weighed.



**Tips:**

Make sure your roses are not sprayed with any pesticides;

When picking the roses, pluck roses by hand just below the calyx, in other words remove the whole rose and not only petals.

Rubbing rose petals with sugar will accelerate the release of the rose aroma

**Ingredient:**

4 cups of clean rose petals, well packed

1 ½ cups of water

½ cup of lemon juice

4 cups of sugar

½ cup of rose water (mawared)



### Preparation Steps:

1. In a cooking pan, mix the rose petals with the sugar. Rub them well to drain water from the petals. Roses will release their aroma and the sugar will soak in the dark pink juice
2. Add the water, water rose and lemon juice then place the pan on medium heat until sugar dissolves, about 10 minutes from boiling
3. Remove the mixture from heat, set aside to cool overnight and cover with a kitchen towel
4. On the next day, cook again on medium heat for another 10 minutes until the required consistency is obtained. Total cooking time should not exceed 30 minutes
5. Fill clean jars with rose jam while hot. Tightly close the lids and turn the jars upside down for a couple of hours. Store jam in a cool place. Place the jar in the refrigerator once opened

- **Shankleesh (Akkar region)**

Aging Shankleesh in the Middle East was originally a way to make it last longer, but still with all the modern cheese-making development and the availability of cheese varieties year-round, this hasn't stopped families from making Shankleesh in certain places like the Northern Lebanese region in Akkar

*Shankleesh is a compound word derived from the Kurdish 'shan', denoting a small terracotta pot; and 'qareesh', a Bedouin term for fermented milk".*



Making Shankleesh is a labor-intensive manual method. The process of transforming yogurt into Shankleesh consists of four phases:

1. Coagulation
2. Dewatering
3. Shaping
4. Maturing

First you need to acidify the yogurt to coagulate it and separate it from the whey, the curd is strained until dried, then you need to salt and season it. Afterward it is shaped to tennis-sized balls that are dried in the sun for a few days. Last step would be the aging stage, the Shankleesh balls are left in tight glass jars away from sunlight, and preferably a dark place, until they develop some rots on the surface, and usually it takes about 1 month or more, depending on the temperature and humidity. The flavor in Shankleesh intensifies with age, the longer Shankleesh is aged the sharper, flavor and character it develops. The Shankleesh balls are scraped clean to remove the rots created by time, finally the balls will be rolled in zaatar/ paprika/ Aleppo pepper or chili flakes.

Brief, Shankleesh gets its taste by fermentation, added flavors and aging. It takes precious time to make, but believe me, you will be rewarded with a special unique type of cheese.

The longer you age Shankleesh the firmer and more intense it becomes. Short aging or only sun-drying the cheese balls will result in a milder paste and softer taste. It is still something you would enjoy at this stage, but if you need the sharp Shankleesh taste, leave balls to ferment in tight glass jars away from sunlight, and preferably a dark place, until they develop a moldy layer on the surface, usually it takes about 30 days or more. Those molds are part of the aging process and are integral to the flavor and texture of Shankleesh.

### **Ingredient:**

#### **Makes 7 Shankleesh balls:**

- 4 kg / 8 lb. whole milk plain yogurt
- 1 1/2 tablespoons sea salt
- 8 tablespoons white vinegar

### **Seasoning:**

- 2 leveled tablespoons salt, or to taste
- 1 tablespoon paprika, optional, but recommended
- 1 tablespoon zaatar, optional
- ½ teaspoon mahlab, optional

### **Coating:**

- Zaatar or Aleppo pepper/ Paprika

### **Preparation Steps:**

1. Over medium heat, place the yogurt in a large pot and stir all the time to prevent it from scorching. Bring to a boil and add the white vinegar and sea salt and turn the heat off. Leave it until it cools down. The yogurt will considerably curdle.
2. Line a colander with a cheesecloth suspended over a large bowl and tip the mixture in the cheesecloth. Put a heavy object on top of the curd to help exert pressure. Refrigerate for 24 hours, making sure to get rid of any excess liquid dripping every few hours. The mixture at this stage should be dry and hard enough to roll.
3. Transfer the content in the cheesecloth to a bowl, the cheese, at this stage, should be firm and easy to work with. Add the seasoning: paprika, salt and mahlab, mix well to integrate with the cheese. Try a bite to see if you want to add more salt, it should be pretty obvious, since salt acts as a preservative.
4. Lay strong and heavy kitchen paper towels on a flat tray.

5. Using clean hands, shape and compress the strained curd to equal balls, roughly the size of a tennis ball, and transfer them to the tray lined with paper towels, leaving space between one another. Ending up with 7 balls. Cover them also with kitchen paper towels. The paper towels will absorb the moisture from the balls. Leave them to dry out in the sun for 6-7 days, or alternatively you can expose the cheese balls to ventilation or air condition during daytime, control of air flow will draw moisture from the cheese balls and help dry out, make sure to change the paper towels whenever they get saturated, and by night refrigerate, that's how it's done. It may take 6 to seven days depending on the temperature and humidity.
6. By now they should be completely dry. You can serve them right away, making sure to dip in olive oil and crust each with zaatar, oregano or paprika. Individually wrap with cling film and keep in your freezer. This is short aging where the taste is still mild; a well-aged Shankleesh will be more pungent, and less creamy. If you need the sharp Shankleesh taste, skip step 6 and keep on reading!
7. Optional:  
To fully mature the Shankleesh: Shankleesh should be totally dry, a good indication is when the paper towels feel dry to the touch. Transfer the cheese balls to a clean dry jar and keep away from sunlight, preferably a dark place for 1 month or even more to slowly ferment; check out the Shankleesh every now and then, once the rots develop on the surface, then it is a sign the cheese has reached the maturation needed. Rinse under running water and scrape clean to remove the rots developed on the surface of the cheese balls, dry with paper towels and roll up individually with zaatar or Aleppo pepper or paprika, keep in the fridge covered or individually wrap with cling film and keep in your freezer. A long process but believe it, it's so worth it.

The most common way to eat Shankleesh is to crumble it, and mix it up with diced tomatoes, onions and freshly chopped parsley with a generous drizzle of extra virgin olive oil. Tear off pita bread/ Arabic bread and scoop it up with Shankleesh.

#### **Ingredients:**

- 1 Shankleesh ball
- 1 small onion
- 1 medium sized tomato
- 1 tablespoon chopped parsley
- 1/3 cup extra virgin olive oil, more if needed

#### **Preparation method:**

Crumble the Shankleesh with a fork until flaky, mix together the onion, tomato and parsley; drizzle olive oil and serve with Arabic bread.

- **Awarma (Bekaa region)**

Awarma was cherished by villagers in the mountains of Lebanon especially the Bekaa region. People back then preserved food as a matter of survival, and Awarma was a way of preserving meat as to safely stop its spoilage; this was specially created so that the families didn't go hungry in winter and a way to sustain them during the cold months of winter and provide them with a safe source of protein at a time when people mostly lived on what they and their neighbors produced themselves, due to the limited transport systems and the lack of refrigeration.



The Awarma used to be sealed and stored in earthenware jars far away from sunlight – these days glass jars are used instead.

Some of the very common ways to eat Awarma is using it to flavor your hummus, add depth to your kishik, scramble it with eggs, and make pita meat tomato sandwiches or even Awarma fatayer.

**Ingredients:**

If you are using minced lamb meat almost any cut is ok, but if you are dicing the meat, it is recommended to use loin or rump since these cuts are tender and full of flavor.

Usually, the best fat used in Awarma is the edible sheep's tail fat (Leyya) – fat of some breed of sheep found in Lebanon and the Middle East

- 1 kg / 2 lb. lamb meat, diced or into 2.5 cm/1-inch cubes, if you are using minced lamb meat almost any cut is ok, but if you are dicing the meat use loin or rump since these cuts are tender and full of flavor.
- 1 kg / 2lb. lamb fat, usually sheep tail fat (liyeh), but any other fat cut can be used, dices into small cubes or ask your butcher to dice it for you.
- 1 1/2 tablespoons salt.
- 1 teaspoon of seven spice or allspice, optional.

**How to Prepare AWARMA:**

1. First off, the meat is cured with a great quantity of salt as part of the preserving process. Seasoning the meat with spice is totally optional.
2. You need to render the fat before adding the meat: It takes about 25 minutes to render it. The slow version will make your Awarma last longer. Cut the fat into small chunks, or even ask your butcher to grind it for you. If you are going to be dicing the fat yourself, make sure it is chilled to make it easier to cut. Use a serrated knife and dice into small cubes, the smaller the better.

3. Add the fat to a heavy bottomed stockpot. Simmer over medium- low heat, stirring and scraping occasionally with a wooden spoon. It takes about 30 minutes for the fat to melt and become clear, leaving small bits of browned fats floating on the surface.
4. Using a fine sieve, strain the melted fat and get rid of those small bits. You can keep them; most folks do keep them.
5. Return the rendered fat back to the stockpot and heat once again, add the seasoned diced or minced meat and simmer uncovered, stirring occasionally. Cook slowly and low until meat is cooked through and well browned, it takes about 30 minutes. Remove it from heat, and set aside to completely cool down.
6. Ladle the Awarma into a large clean jar or small jars. As you can see the fat has eventually completely covered the meat. The large amount of fat pushes air out and liquid down. The removal of air creates a tight seal preventing bacteria from growing. That's the reason Awarma can be stored at room temperature without the need for refrigeration. But still it is recommended to put the jar of Awarma in the fridge, to be 100 percent on the safe side.
7. Once it cools down the fat hardens, creating a solid of white and brown mosaic. It is preferable to store the Awarma in the fridge. Seal the lid and cover the jar with a piece of cloth to keep your Awarma jar moisture free. Awarma could be kept well for a duration of 1 year.

## CONCLUSION

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“Mouneh” products constitute a large part of Lebanon’s culinary heritage, as such they continue to be an important aspect of the everyday food for local consumers. Also, given the large size of the Lebanese diaspora, these products are highly demanded abroad. This is reflected by a CAGR that is slightly higher than 10% between 2001 and 2020, exceeding the growth in imports of similar products (2%). In this context, several entities have launched “mouneh”-related initiatives, given the size of the demand abroad, the most recent one being Mounehbox, a free platform created by the Embassy of Lebanon to Canada’s Trade division, which connects the Canadian community with suppliers of Lebanese traditional food in Canada. The size of the diaspora and its high demand for the “mouneh” segment provide significant export opportunities for suppliers in Lebanon.

While competitors exist around the region, Lebanese producers are able to provide an authentic and unmatched experience in the production of “mouneh” given the ancient traditions and expertise used in making these products. However, there is significant room for innovation, as these products are mostly standardized, in order to fit young consumers and generations in Lebanon and abroad. Some producers have already started to introduce twists to some “mouneh” products. In addition, producers should focus on the packaging and branding for “mouneh” products, in order to keep this segment as a main cash flow in the business sense for many agri-food producers in Lebanon. Innovation in tastes, packaging and branding will help producers unlock new segments of consumers abroad beyond the ethnic markets. Also, producers should highlight the Mediterranean aspects of these products and their fit within the Mediterranean diet, that is highly demanded and is being ranked as the best diet for 2021.

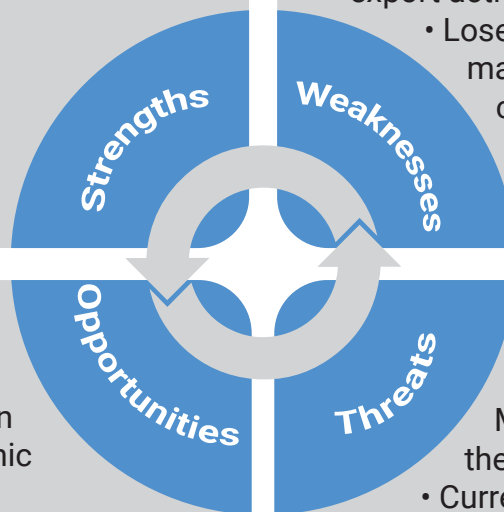
Lebanese producers can monitor the developments in market share, sales and exports of competitors in the region to be able to identify additional opportunities and the right positioning of their products, using some of the tools mentioned under the Macro trends chapter.

Constituting a big part of the Lebanese food culture, Mouneh is considered as a sacred ritual among the people. Virtually every house in the country still practices some form of mouneh-making, and every house claims theirs is the best! From inputs available in every corner of the market to secrets handed down from generation to generation, each Mouneh product is specialized and bares the identification of a specific region in Lebanon, which paved the way to numerous innovations within the same product. All these reasons have led Mouneh products to develop a unique identity capable of penetrating any market and any culture, taking a place on the shelves of supermarkets and houses around the globe.

## SWOT ANALYSIS

- "Mouneh" is a large part of Lebanon's culinary heritage
- Sheds light on ancient traditions in Lebanese culture
- The segment provides a wide range of vegetable-based products as well as some products of animal origin
- The "Mouneh" segment is embedded within the Mediterranean diet
- Do not require large investments due to expertise
- New innovations easily introduced and demanded, as products have been there for a long time

- Fragmented market with a large number of micro-producers, as well as households aiming to sell their output
- Some producers remain unable to commercialize their output, due to their small size & weak organization
- Technical and quality requirements are not easily accessed by small producers
- Difficulty to commercialize "mouneh" products globally, as branding remains local and ethnic and at a small scale
- Producers are not motivated to spend on packaging and branding due to challenging economic conditions
- Producers find difficulties to finance export activities, due to financial crisis
  - Lose access to international markets due to low compliance with international standards and requirements



- Substituting imported products
- Benefit from the growth in the global demand for ethnic products
- Take advantage of the global interest in Mediterranean diet
- Provide a large variety of products for vegans and vegetarians
- Large opportunity for innovation through the transmission of "mouneh" producers from a generation to the other
- The large diaspora highly appreciates Lebanese culinary traditions

- Lose market share against competitors in the Mediterranean, especially in the Levant
- Current crisis to limit investments and innovation, leading to a deterioration in quality
- Unable to attract producers from new generation, and lose these traditions with time

## REFERENCES

---

- Lebanon's Mouneh, Taste and Flavors. 2015, Accessed on August 2021  
<http://www.tasteandflavors.com/lebanon-mouneh/>
- The Importance of Mouneh provisioning in Lebanon, The Food Heritage Foundation.2013, Visited on Accessed 2021  
<https://food-heritage.org/the-importance-of-mouneh-provisioning-in-lebanon/>
- Marvelous Mouneh, Lebanon Traveler. 2011, Accessed on August 2021  
<https://www.lebanontraveler.com/en/magazine/lebanon-traveler-mouneh-defining-the-craft-of-p-reserving-food/>
- Shanklish & Awarma, Hadia Lebanon Cuisine. 2013, Accessed on September 2021  
<https://hadiaslebanesecuisine.com/newsite/recipe-items/shanklish/>  
<https://hadiaslebanesecuisine.com/newsite/recipe-items/awarma-qawarm-lebanese-lamb-conf-it/>
- Rose Petal Jam, The Food Heritage Foundation.2013, Visited on Accessed 2021  
<https://food-heritage.org/rose-petal-jam/>
- Khairallah, L., Chedid, M., Jaber, L., Martiniello, G. and Hamadeh, S.K., 2022. Traditional dairy goat value chain in Lebanon: an uneven distribution of values. Journal of Agribusiness in Developing and Emerging Economies.  
<https://www.enicbcmed.eu/sites/default/files/2020-11/AUB%20Desk%20Review-%20Final%20DRAFT%201%20-MedSnail%2030320.pdf>
- Mediterranean diet named best diet for 2022, CNN. 1993 Accessed on September 2021  
<https://edition.cnn.com/2022/01/04/health/mediterranean-diet-2022-best-diet-wellness/index.html#:~:text=In%20the%20best%20diet%20for,to%20swear%20off%20meat%20completely.>
- Economic crisis led locals to rediscover traditional food, SBI. 2005, Visited on September 2021  
[https://english.sawtbeirut.com/lebanon/economic-crisis-led-locals-to-rediscover-traditional-fo](https://english.sawtbeirut.com/lebanon/economic-crisis-led-locals-to-rediscover-traditional-food/)  
[od/](https://english.sawtbeirut.com/lebanon/economic-crisis-led-locals-to-rediscover-traditional-fo)
- Saade, A., Kayed, H., Fahed, Z. and Hamade, K., Exploring Alternative Food Initiatives in Lebanon. 2021.  
<http://www.jibal.org/wp-content/uploads/2021/12/FOOD-INITIATIVES-REPORT.pdf>



- Jalkh, R., Dedeire, M. and Requier Desjardins, M., 2020. An introduction to food cooperatives in the Bekaa Valley, Lebanon: Territorial actors and potential levers to local development through culinary heritage. Food Ethics, 5(1), pp.1-18.  
<https://hal.archives-ouvertes.fr/hal-03137540>
- ITC Trade Map. 2003 Accessed on September 2021  
<https://www.trademap.org/Index.aspx>
- ITC Export Potential Map. 2003 Accessed on September 2021  
<https://exportpotential.intracen.org/en/>