

MedBEEsinessHubs Project C_A.1.2_0035

Output 3.1

Existing situation analysis (study reports) on the economic potential of honeybee handcrafting

A3.1.4

Preparation of a consolidated report on the economic value of the bee-economy concept

Responsible Partner: Chamber of Commerce Industry & Agriculture in Zahle & Bekaa - CCI AZ

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Introduction

This report was prepared by the Chamber of Commerce, Industry and Agriculture of Zahle and Bekaa (Lebanon), within the framework of the project entitled “Mediterranean Bee Hubs in support for sustainable economic prosperity in deprived rural areas” (MedBEEsinessHubs), co-funded by the EU under the ENI CBC MED and implemented during the years 2022/2023, aims to gather information of reports presented by different partners within the framework of the project:

1. The Cyprus Chamber of Commerce and Industry in partnership with “Villagrotiki Consulting” (Cyprus);
2. The Federation of Egyptian-European Business Associations (Egypt);
3. The Italian Arab Cooperative Chamber (Italy) and
4. The Palestinian Business women Association – Asala.

This report’s objective is to underline similarities and differences observed in the five Mediterranean countries of the project and to help decision-makers to formulate plans for developing a more economically robust honey industry in each country and at the Mediterranean level.

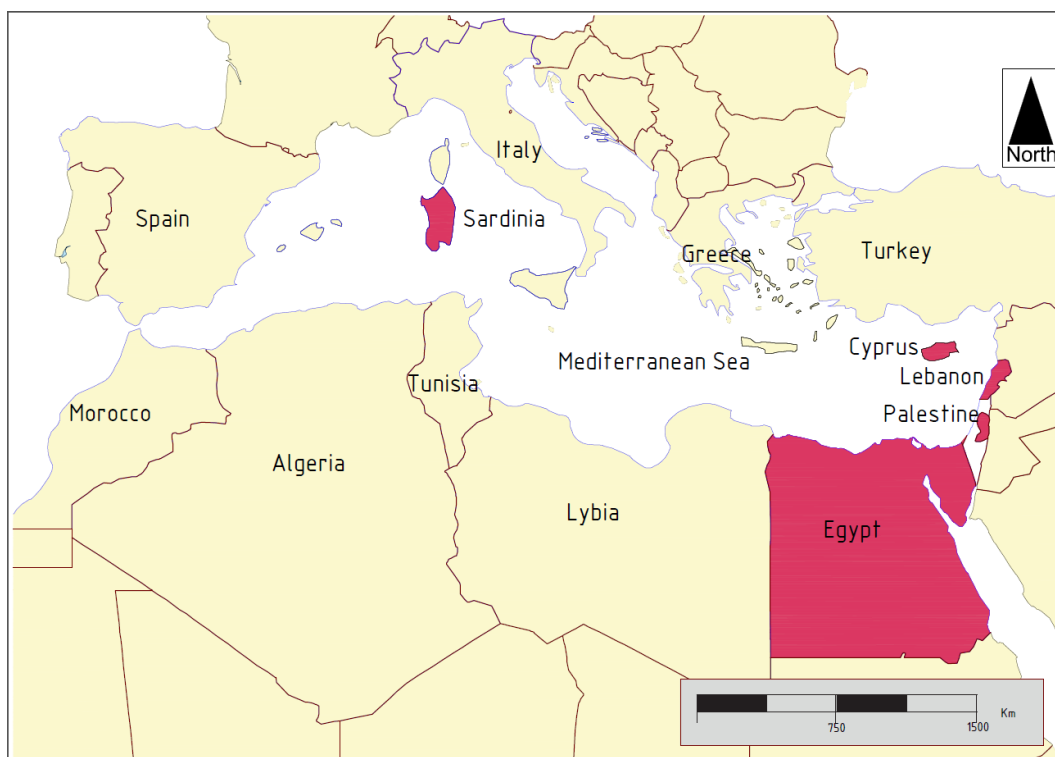


Figure 1: Map presenting the five partners countries

1. The beekeeping unique characteristics in the region – an overview

Traces of beeswax on prehistoric potsherds have revealed that the harvesting of bee products by man has been practiced in Greece since the Middle Neolithic period 5500 B.C. (Decavallas, 2007). The harvest of honey is one of the oldest human activities in the Mediterranean area. As showed also in the famous prehistoric cave painting of the Cave of the Spider in Spain near Bancorp in the Region of Valencia, dated according to different sources to 8000 years B.C. (Crane, 2000).

The countries of the Mediterranean basin are an area of excellence for beekeeping, in this area, the exploitation of domestic bees for beekeeping has been practiced since ancient times. This activity was also common during the High-Egyptian Empire in the XXIV century B.C. and in ancient Greece (Apiculture Treatise of Aristotle). Two types of ancient ceramic beehives have been identified, horizontal and vertical. The horizontal beehive, a tubular container, was probably widespread in the Mediterranean area in antiquity (Anderson-Stojanovic and Jones, 2002; Bonet and Mata, 1997). This type of beehive, ceramic or other, was widespread in traditional apiculture in Morocco, Egypt, Palestine, Jordan, Syria, Lebanon, Iraq, Iran, and the Arabian Peninsula (Crane 2000), as well as in Greece, Crete, The Aegean islands, and Cyprus (Jones et al., 1973)

Despite the difference in geo-climatic conditions in the five partners countries, the beekeeping sector is considered an integral component of agriculture, rural development, and national economic development and plays a critical role in the conservation of ecosystems in these countries. Because the western honey bee *Apis mellifera* L. (Hymenoptera: Apidae) is the main animal pollinator (Hung *et al.*, 2018) and it plays a role in not only maintaining plant biodiversity but also sustaining the most critical agricultural productions. In fact, of the 100 crop species that provide 90% of the world's food, over 70 are pollinated by bees. This crucial role of *A. mellifera* is also because the anthropo-activities and climate change significantly reduced the number of other animal pollinators (Goulson *et al.*, 2015; Potts *et al.*, 2010; Winfree *et al.*, 2009), while *A. mellifera* is predominantly farmed worldwide, and according to FAO data (FAO/STAT 2020), the number of beehives in the world increased by 13.6% in the last decade.

The milder climate of the Mediterranean region benefits beekeeping. Dry summers and mild, wet winters can be especially beneficial for the indigenous breeds of the partner countries (*Apis mellifera cypria* in Cyprus, *Apis mellifera syriaca* in Lebanon and Palestine, *Apis mellifera ligustica* in Sardinia, and *Apis mellifera lamarckii* in Egypt) that have evolutionarily adapted to these conditions. Each of the subspecies possesses behavioral characteristics that enable it to adjust, better than other subspecies, to specific ecosystems of their region (for example *A. m. cypria* & *A. m. syriaca* has notable defensive behavior against the oriental hornet attacks; as well, Lamarck's bee is a good housekeeper but a mediocre honey producer). Due to the introduction of foreign queens and honeybees for decades, indigenous subspecies in each of the project's countries require conservation actions and certainly in need of more targeted research.

Four over five partner countries in the project are small countries blessed with many different microclimates and rich biodiversity which allow some beekeepers to practice transhumance by traveling their colonies from one area to another following the blossoming season and producing a wide range of poly-floral honey with high quality and reduce the risk of climatic changes on the hive productivity. While Egyptian beekeepers should place their colonies near cultivated plants to harvest mono-floral honey and produce bee packaging (Live bees that are exported or sold locally).

Field work conducted in three over five partner countries via a survey served to visualize the situation of the beekeeping sector in the targeted countries and identified the need for this sector. The results of the assessments aimed to clarify vision and information in different directions.

The beekeeping sector in the targeted countries is considered a man's job since the presence of women in this sector does not exceed 10% in Palestine as well results of the Lebanese study indicate that women beekeepers were just 3.8%. But the role of women remains particularly important in beekeeping sector derivatives (cosmetics, honey extraction & packaging, ...). The age of interviewed beekeepers differs from one country to another since the age of Egyptian beekeepers ranged from 20 to 65 years and most of them are middle-aged (59 % between twenty-six & 45 years old), while in Lebanon the age of respondents ranged from 20 to 85 years and the highest percentage was observed for those having between 46 and 65 years.


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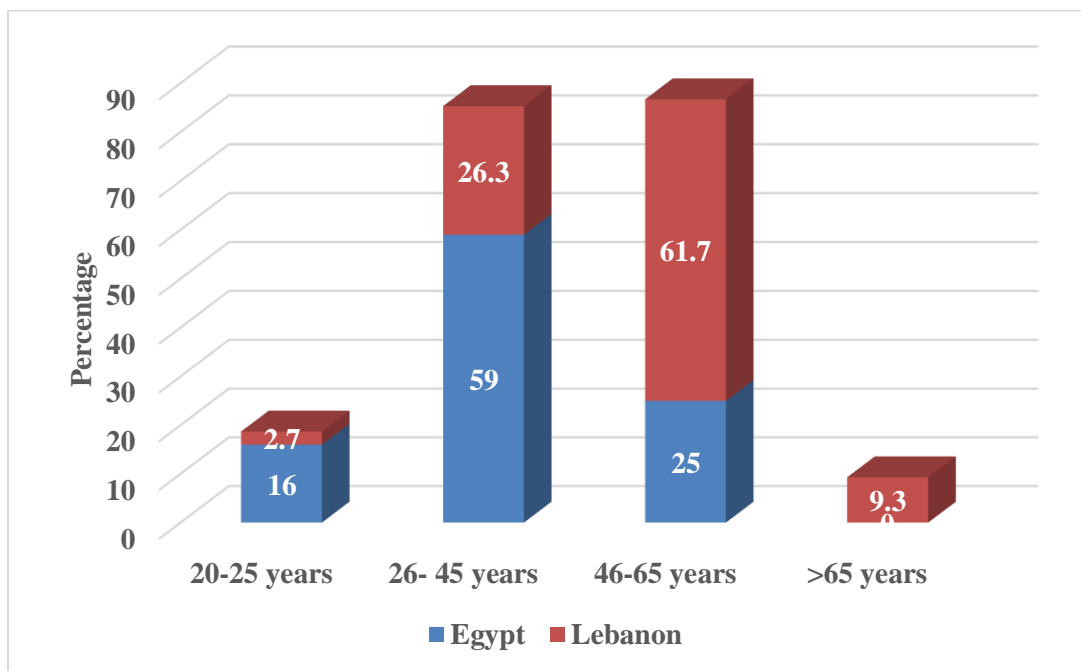


Figure 2: Distribution of interviewed beekeepers in Egypt & Lebanon in percentage upon different age categories

These results were reflected directly to the targeted respondents in each country. Lebanese beekeepers had longer experience in the sector in comparison to Egyptian beekeepers. A study conducted in Sardinia shows that over half of the respondents have an experience in the sector between 1 and 10 years which shows the importance of youth in this sector in this country.

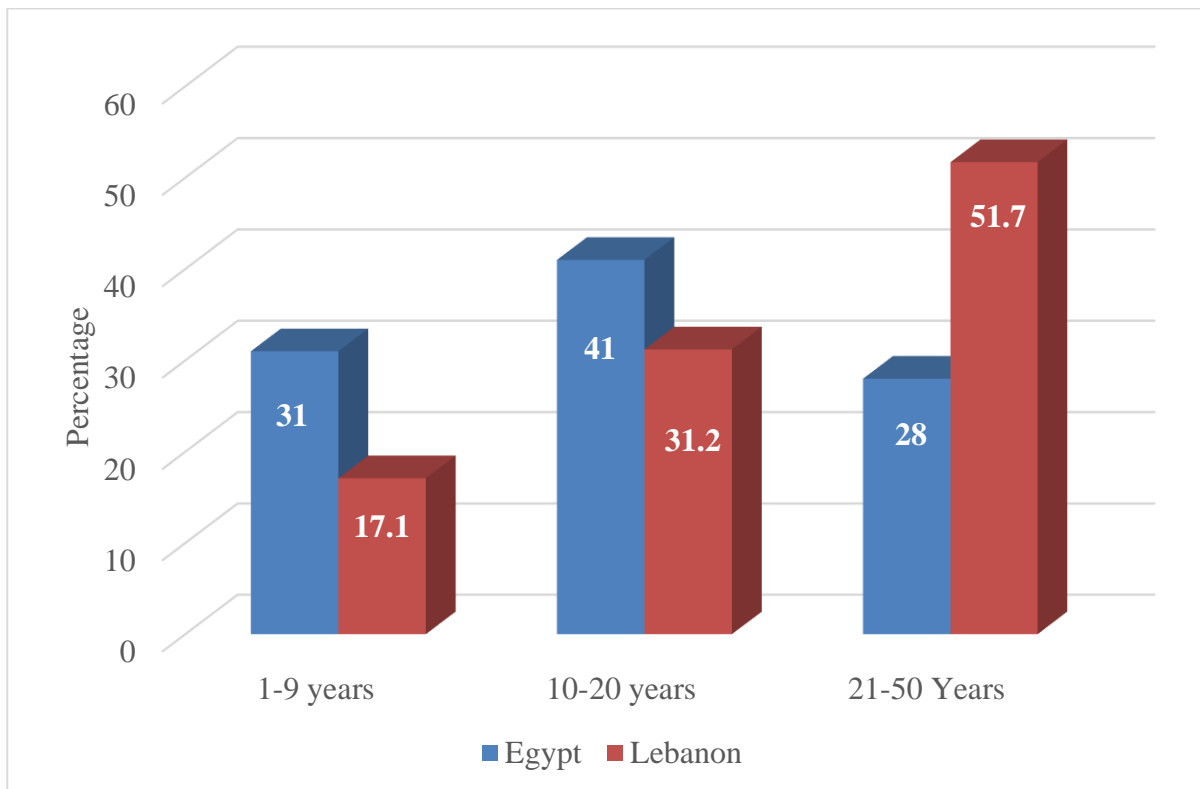


Figure 3; Classification of the Experience of interviewed beekeepers in Egypt & Lebanon (in percentage)

From what emerged from the answers given by respondents in Sardinia, 75% of the candidates hold the profession of beekeeper and honey processor, the remaining 25% is divided between different professional figures including an organizer of consortium products, and service companies related to agriculture. While in Lebanon livelihood of 39.2% of the respondents depends only on this sector and for the others, beekeeping is practiced as sideways with other agricultural & non-agricultural activities (employment or free-lancer).

In the five partner countries, the main type of beehive used by beekeepers is the modern one, where three over five countries still rarely use traditional beehives. Cypriot study highlights the presence in 2005 of 890 traditional tzivertia type over 44338 modern hives. In Palestine, there are about 1,500 to 2,000 old clay hives. In Egypt, the remote Siwa Oasis is home to pure *A. m. lamarckii* populations that are raised in traditional hives (mud-tube hives). In Sardinia & Lebanon, all types of beehives are modern Langstroth type wooden and rarely plastic.

The adherence of beekeepers to cooperatives, associations, and/or syndicates was respectively 31,6% & 40% in Lebanon & Egypt.

Beekeepers confirm that most indigenous subspecies existing in the five partner countries has been hybridized with imported species, this is due to the uncontrolled import of queen bees in the targeted countries.

Interviewed beekeepers note that access to scientific information or guidance services is very weak in their countries this is the case in Cyprus, Egypt, Lebanon & Palestine. Cypriot SWOT analysis confirms that beekeepers lack education and no access to modern technology. In Egypt, 75% of beekeepers consider that the source of scientific information about beekeeping mostly comes from relatives and friends, while in Lebanon WhatsApp groups are the common way for beekeepers to get solutions to their problems; Finally, in Palestine low experience of small-scale beekeepers has noted.

Transhumance or migratory apiculture is considered an essential practice for professional beekeepers in all partner countries which allows them to fetch a good amount and the biggest range of quality honey. In Egypt it's practiced by 78.9% of beekeepers, in Cyprus transhumance is practiced in order to take maximum advantage of different microclimates, in Lebanon this activity is practiced by 76% of the respondents is done between coastal zone in autumn and winter to medium altitude in spring and finally to high altitude in summer profiting from wild vegetation in each area and allowing some Lebanese beekeepers to collect until four harvests/year, in Palestine some restriction should be taken into consideration to avoid competition between beekeepers and low productivity due to overcrowded hives.

The increase in the cost of production concerns beekeepers in Lebanon, Egypt, Palestine & Sardinia which are induced by the economic crisis, a worldwide increase in the price of fuel which directly affects the cost of transportation, and the fluctuation in productivity showing a decline in the last decades.

Results of the Lebanese & Palestinian study reveal the importance of the “personal saving” practiced by beekeepers to start their beekeeping business. In addition, in Lebanon only 4.9%, of the interviewees started their business by taking loans from MFIs (Bank Loan or MSE loan).

Along the famously used hive products, honey is the one that leads the list in all countries covered by the project; hence, it is known that the beekeeping sector is essentially interested in the production and marketing of honey, in the second position comes the production of bee wax a very high percentage of beekeepers in Cyprus, Lebanon, Palestine & Sardinia, produce bee wax, and almost all of the production is for the wax foundation. While in Egypt the second position is preserved to bee package who is exported to GCC countries in addition bee wax produced in Egypt partially goes to the wax foundation and a significant quantity is exported (115 Tons in 2015). Production of Pollen, Royal Jelly, and propolis gained importance in the targeted countries for professional younger beekeepers who are awarded about their importance as an alternative and added value products, more and more appreciated by consumers, but still considered marginal. The specificity of Pollen as protein replacements for beehives in winter is persuasive in all countries. Finally, bee venom, is poorly produced by beekeepers in all projects' countries due to the difficulties encountered in its production and harvesting and their conservation are very delicate and require specific market.

Studies conducted in the targeted countries highlight the importance of the beekeeping sector for employment which is directly correlated to the size of the business it's considered familiar for small-scale beekeepers and become seasonal for medium size beekeepers and big-scale beekeepers or beekeeping company or associations.

As for the commercial channel, beekeepers manage to get the highest price with direct sales to consumers which is variable from one area to another: 31% of production in Sardinia sold directly to consumers, 75.6% of surveyed beekeepers in Lebanon sell their products directly to the consumer. In Egypt, most beekeepers (93 percent) sell their honey directly to consumers, and Cypriot & Palestinian honey is in its majority sold directly to the consumer. Some Sardinian beekeepers try to sell honey via packaging companies (24%) and distribution companies (16%) or to food industry. In Lebanon the second option of marketing goes to wholesalers and retailers (19%



of the respondents try to sell part of their honey produced to wholesalers or retailers the proportion is variable from 5 to 90% and depend on the marketing strategy of each beekeeper), as for Egyptian beekeepers they sell a portion of their production to companies, brokers, and exporters.

2. The flora and the ecosystem that supports the bees

The Mediterranean Basin is the third richest hotspot (among the 34 biodiversity hotspots identified worldwide) in the world in terms of its plant biodiversity (25,000 species), and one of the most important areas on Earth for endemic plants. Mediterranean vegetation shows several adaptations to drought, grazing, and frequent fire regimes.

Although much of the Mediterranean Basin Biodiversity Hotspot was once covered in evergreen oak, deciduous, and conifer forests, 8,000 years of human settlement and habitat modification have distinctly altered the characteristic vegetation. (Critical Ecosystem Partnership Fund - CEPF)

Among this rich plant biodiversity, melliferous species are spread over all Mediterranean biomes, plains, mountains, valleys, and islands. One of the common characteristics of these melliferous species in Mediterranean countries, especially Italy, Cyprus, Lebanon, Palestine, and Egypt, is the fact that blooming period cover 10 months (February - November) with lack of nectar and pollen during December and January (The coldest months).

The two islands; Sardinia and Cyprus, are characterized by a special richness in term of wild plants. As well, citrus orchards present an exceptionally good pasture for bees. According to the Pollen Atlas of the Honey Flora of Cyprus, at least bees feed on 120 species, among which citrus and thyme are the most important to produce two types of honey as the major honey production in the country (more than half of the total production). As well, Sardinia' island presents a high number of melliferous species (200); in addition to the rich wild plant biodiversity in the island, some introduced species such as Eucalyptus and Chestnuts (*Castanea sativa L.*) showed to be of high importance for bees and beekeepers and of high nectareous value.

Egypt, known to be the largest agricultural countries in the Mediterranean basin, offer to the Egyptian bee's population a large quantity of pollen and nectar, through distinct species of citrus trees, cotton flowers, clover, and distinct species of aromatic plants.

Arriving to the neighbor Palestine, the nectareous plants richness increases to reach 143 species belonging to 37 families (Apiacea 3%, Boraginaceae 6%, Compositae 19%, Cruciferae 6%, Fabaceae 5%, Lamiaceae 17%, Papilionaceae 4%, Resedaceae 4%, Rosaceae 5%). Most of these

species are source of pollen and nectar for bees (68%) almost one third is a nectar source only (29%) and about 12% are a source of pollen only.

On the eastern coast as well, the Lebanese flora is a typical eastern Mediterranean flora, characterized by mild winters and dry summers, with different altitudes ranging from 0 to 3000 m above sea level giving place for more than 2600 species among which 108 are endemic to Lebanon. Beside the recently 153 listed melliferous plants, several Oak species, Cedars are known to be the source of the honeydew to produce the well-known "black honey". Unfortunately, this richness is decreasing year after another due to wildfires that takes place every year in Lebanese mountains.

3. The beekeeping sector of the region in numbers

According to the data collected in each of the partner' countries in the project the number of beekeepers and beehives is very variable from one country to another, as well variation is detected between region in each country (46% of the beekeepers are presents in Cagliari in Sardinia, Limassol & Nicosia group the highest number of beekeepers, Asyout governorate in Egypt group the highest number of beehives, In Palestine the greatest number of hives is in the Jenin governorate, in Lebanon the Minieh – Daniyeh and Jbail Caza counted the highest number of beehives and covered respectively 19.44% & 12.86% of the national number of beehives). The average number of colonies per beekeeper ranged from 27 (in Sardinia) to 77 (in Cyprus). These numbers reflect partially the number of beekeepers over the national bee livestock and the level of professionalism of the sector in each country (table 1).

Table 1: The beehives & beekeeper distribution in each partner' countries

	Beekeepers	Beehives	Average number of colonies per beekeeper
Cyprus	755	58,184	77
Egypt	25000	934517	37
Lebanon	10825	417,233	38
Palestine	2000	64,595	32
Sardinia	2238	60,000	27

Difference in professionalism is perceived between countries since the percentage of beekeepers owning more than 150 beehives, which indicate belonging of the beekeeper to his job, constitute 10.7% & 8% respectively in Cyprus & Sardinia which confirms the good specialization of operators in these countries, while in Lebanon this percentage is only 3.1%. A comparison between Cypriot & Lebanese beekeepers reveals that the percentage of hobbyist beekeepers and those owning from 11 to 50 hives are predominant in Lebanon while Cyprus has more groups of beekeepers owning greater than 50 hives (figure 1).

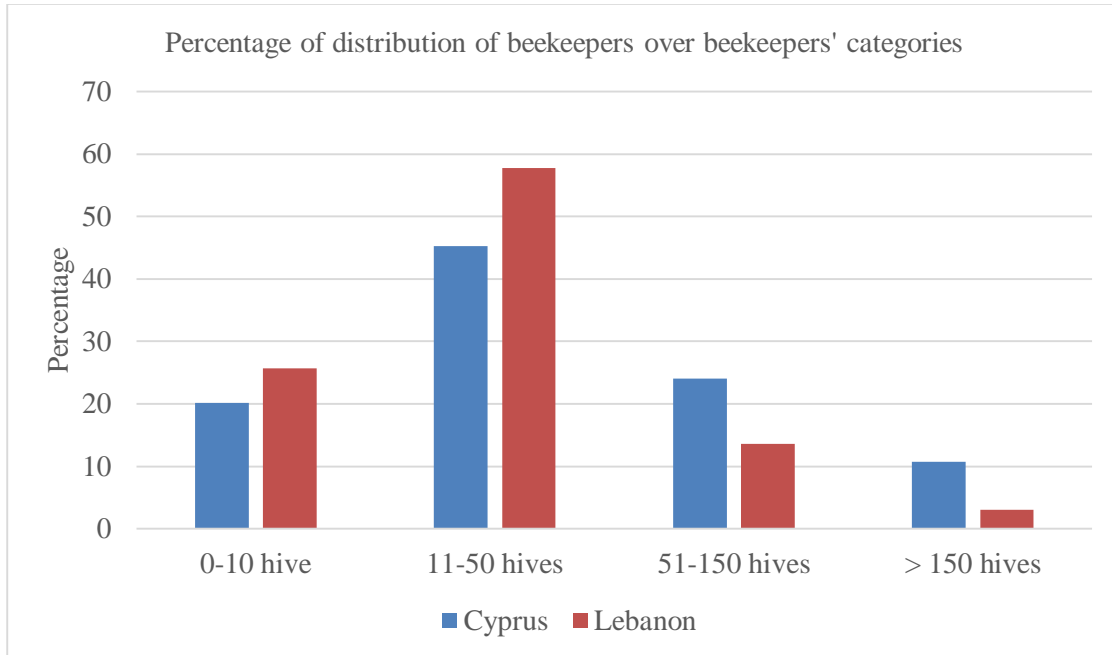


Figure 4: Distribution of Cypriot & Lebanese beekeepers over beekeepers' categories

A big variation in honey harvests was observed from one country to another, as well this variation is reflected in each country from one region to another and from year to year which are due to many factors (Climatic conditions, presence nearby, of a honeydew honey, the colony density, and the type of beekeepers). Moreover, there are many other influences, unknowns, contribute as well to these large fluctuations. The average honey production is variable from 6 to 16 kg per hive, three countries (Egypt, Lebanon & Cyprus) indicate an average of honey production lower than 10 kg/hive, while Palestine & Sardinia had an average of 12.49 & 16.67 kg/hive respectively (figure 2).


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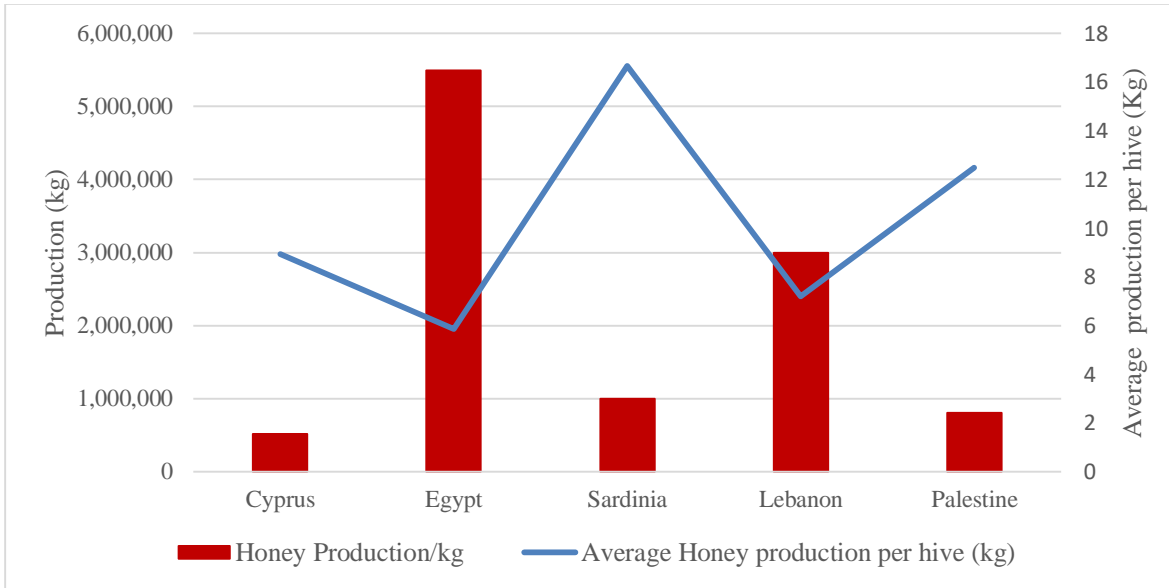


Figure 5 : Total production of honey and average production of honey per hive in each of the partners countries.

4. Beekeeping economic figures and employment in rural regions

The variation in the number of bee colonies is not perceived in the same way in the five partners' countries. In Lebanon national bee livestock increased by approximately 50% during the last decade, but the economic crisis will negatively affect the evolution of the sector since beekeepers are subjected to low financial returns from their honeybee colonies and the low capacity of purchase induced by consumers. The picture is reversed for Egyptian bee livestock where 43% decrease was noted between 2002 to 2019. Cypriot & Palestinian studies indicates no particular change in beekeepers or beehives during the last decade.

Studies conducted in the partners' countries indicate the importance of the beekeeping sector in the creation of employments in rural area since this sector is related to the availability of sufficient bee forage in terms of both quality and quantity of nectar and pollen grains which are presents in the rural areas. In addition, when beekeepers become specialized their need for permanent staff increase. Results showed that beekeepers owning from 150 to 500 beehives usually employ temporary workers to help them during springtime and harvesting period, in addition professional beekeepers try to hire permanent staff.

In terms of export and import of bee products, it is important to highlight that the export of Cypriot honey is very limited less than € 50,000 annually (2018 data), as well in Palestine for the year 2020, the value of imports of honey reached about 1,289 million dollars, compared to 279,000 dollars in exports, while the value of importing live bees reached \$85,000 in 2020, without any export. Lebanon exported in 2021 14 Tons of Honey and import around 92 Tons. Italy, present the same trends since the data of international foreign trade, referring to 2019, attest that Italy ranks 9th among importers in terms of volume (7th by value), but is also present in a more secluded position among exporters (23rd position by volume, 20th by value). These figures reflect a deficit in the trade balance at the level of import and export in the bee sector and its derivatives in 4 over 5 partners' countries. In Egypt, the figure is reversed, the Egyptian Ministry of Agriculture revealed that exports of bee products had reached \$300 million, with 30 thousand tons of honey produced and 3,200 tons exported. In 2021, Egypt ranked top globally in exporting bee packages.



As well, in 2018, Egypt exported over 115 Tons of bee wax, making it the leading exporter of this items in the Mediterranean region.

When examining the distribution of hives in the territory in some countries, we found a strong aggregation in Lebanon where honeybee density per square kilometer is 40.75 colonies/sq km and ranging from 9 to 206 beehives/sq km. In Sardinia, this density varies from 13 to 25 hives/sq km and still considered clearly higher than the average values highest reported in Europe (Greece: 11.4 hives/sq km), note that in Italy and in Europe this density is respectively 3.7 & 4.2 hives/sq Km. Cyprus is at the same level as Europe with 4.3 hives/sq Km.

Official state figures in the 5 targeted countries show that the quantities of products other than honey are small, exception observed in Egypt where the production of bee wax & bee package is significant. As for the commercial channel, beekeepers manage to get the highest price with direct sales to consumers; the second-best option is to sell honey to retail shops or supermarkets, finally wholesalers or packaging companies and/or the food industry are the outpension for beekeepers.

5. A SWOT analysis of the beekeeping sector in the region

Strengths and weaknesses as well as opportunities and threats for beekeeping development are identified using the SWOT analysis method in each of patterned countries. This type of analysis



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served to set strategic objectives and choose a strategy for the development of the sector in each country by knowing of all specific, internal, and external environmental, factors that have a direct and indirect impact on the beekeeping sector, which can either enhance or weaken its resilience to many threats. In addition, a comparison of results in the five countries covered by the project was made to constitute a list of learned tools which be used to enhance the sector in each of the countries. Global results of the Strength identified shows that:

- A certain similarity in observation was noted between Cyprus, Lebanon, Palestine & Sardinia in terms of richness in biodiversity & presence of different microclimates which directly affected the production of a wide range and high quality of Honey, pollen & propolis. In these countries, the small geographical area, and the fragmentation of agricultural land, don't allow monoculture which results of the production of Honey from premium quality due to its multifloral characteristic.
- The moderate climate in Egypt and Cyprus and in the coastal area in Lebanon and Palestine presents an advantage for these countries to start their beekeeping season earlier and begin production (colonies growth, honey, Royal Jelly & Pollen productivity) in the year before other European countries. As well, warm spring and the dry-warm summer affect positively the quality of Honey in term of humidity content.
- The spread of beekeeping associations and honey brands in Egypt is considered a motivation to create contemporary brands and promote beekeeping along the product chain.
- Beehives products of holy land give Palestinian beekeepers a good market potential locally and in the other Arab countries.
- The growing presence of biological productions in Sardinia is considered a particular strength which is marginally developed in the other countries and can be considered a good potential for them in the future.

Table 2 : Comparison of Strength between the five countries covered by the project.

Strength	
<u>Cyprus</u>	<u>Egypt</u>



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<ul style="list-style-type: none"> - Spring begins early in the year. Many times, from February, with temperatures reaching above 18-20°C that result in the growth of bee colonies early. Therefore, the production of Honey and other products start earlier in the year in comparison with other European countries. - Due to the small geographical area of Cyprus and the fragmentation of agricultural land, there are no monoculture in a large scale. So, per collection area, bees encounter great diversity in plants. This, initially, helps bees in terms of health and well-being but also in the production of products. The honey produced is rich in many different pollen grains and the honey produced per region is different in taste, smell, and color. For those who collect pollen, natural mixtures are created from various plants. The pollen of each flower has a distinct color and contains a different percentage of protein and trace elements. The same happens in the propolis collection, which is enriched by many different secretions of plants. That is why from region we find propolis of distinct color (green, brown, black) with different percentage of antiseptic substances. - Due to the warm spring and the dry-warm summer, the nectar in the blossoms is more concentrated, resulting in the production of honey that is quite viscous, compared to the honey produced in other countries of northern Europe. The honey is more aromatic but have an ideal humidity of 14-18%, without the risk of yeast growth and microorganism. 	<ul style="list-style-type: none"> - Diversity in agricultural crops and continues blooming - Egypt's geographical location and climatic conditions are suitable for production. - Limited land area needed for apiary construction. - The Egyptian beekeeper has good competitive skills, and beekeeping is an inherited profession and well-known. - The availability of the necessary expertise, which facilitates the management and follow-up process, proper planning, and the ability to expand in the future. - The early, low-cost production of bee packaging results in a distinctive, in-demand product on the international market. - Availability access to raw materials in suitable time. - Diversity of the honey types and the spread of complementary and supportive industries. - The availability of improved and new beekeeping practices. - Sufficient investment in beekeeping - The widespread of beekeeping associations in Egypt.
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Strength		
<u>Lebanon</u>	<u>Palestine</u>	<u>Sardinia</u>
- Honey Price: the price of mountainous Lebanese honey is among	- Quality of Honey	- Strong Environmental Relevance (Indicator of the



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<p>the highest in foreign markets especially in the gulf countries</p> <ul style="list-style-type: none"> - Bee pasture: Lebanon is known to have one of the richest biodiversity of melliferous plants. - Honey quality: Lebanese honey is mostly produced from a wide collection of wild species in the mountains that gives it high quality. - National governmental support: The ministry of agriculture, LARI, IRI, and QCC have plans to provide services for beekeepers (laboratory testing facilities, diseases control) - National Non-governmental support: International Agencies, International NGOs and Local NGOs have implemented several projects to develop the beekeeping sector (quality control, capacity building of beekeepers, cooperatives, packaging and marketing, Queen rearing center, bee pasture) - Standardization: LIBNOR has set stricter honey standards to ensure quality - Direct sale: Most of beekeepers sell their production directly to consumers and get all the profit. - Labor: For most of beekeepers (hobbyist and small) beekeeping is a family business without or with minimum labor cost. - COVID: This epidemic affected positively the demand on honey. - Cooperation and communication: Several WhatsApp groups of beekeepers are established to facilitate cooperation. 	<ul style="list-style-type: none"> - Diversified climatological areas with many flowering plants in small area enable producing honey most of the year - Product of holy land - Good market potential “locally and to other Arab countries - High demand - Low starting costs projects - Potential for high production 	<p>state of health of the territory and protection of spontaneous plant species through pollination)</p> <ul style="list-style-type: none"> - Powerful network effects - Robust cultural heritage - Growing presence of biological productions
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Some of the weakness similarities & differences are summarized below:

- High climatic dependency of the beekeeping sector was observed in Cyprus, Lebanon, Palestine & Lebanon. This variation will significantly affect the productivity.



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- Lack of access to innovative technologies, techniques, and materials, in addition to a poor communication with research centers was noted by Cypriot, Egyptian and Palestinian beekeeping sector.
- Excessive cost of production of Honey is persuaded as main weakness which enable beekeepers in Cyprus, Egypt, Lebanon & Palestine to export the product add up by the predominance of small-scale beekeepers in these countries.
- Cypriot & Lebanese SWOT analysis reveals a lack of budget allocated from government to support this sector
- A necessity to boost marketing of bee product was raised by Egyptian, Lebanese, Palestinian partners who must learn from the national marketing strategy applied in Cyprus to avoid yield' stagnant of honey observed in some partner countries.
- Lack of specialized laboratory test for bee products was observed in Lebanon and Palestine.
- Dwindling of bee pastures induced by overgrazing, fire, territory occupation... as well the uncontrol use of pesticide are considered important handicaps to the development of the beekeeping sector in Lebanon & Palestine.
- The absence of certified bee queen center in Egypt and Palestine could be adjusted by the creation of such center like the one noted in Lebanon.
- Prone to adulteration perceived in Sardinia, Palestine & Lebanon need additional governmental control.
- Reduced use/diffusion of quality and origin certifications observed in Sardinia can be a starting point if applied to enhance the marketing of product.

Table 3 : Comparison of weakness between the five countries covered by the project.

Weakness	
<u>Cyprus</u>	<u>Egypt</u>



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<ul style="list-style-type: none"> - Short winters, with little rainfall and mild temperatures. This initially creates a problem for bees in matters of health and well-being, as the beehive does not rest and spends energy all year round. In terms of production, reduced rainfall negatively affects wild vegetation which is an important source of nectar and pollen for bees. - The beekeeping world is outdated/obsolete and attached only to traditional beekeeping. They also lack education and have no access to modern technologies, techniques, and materials. - There are no sufficient incentives, from the state, for a young person to get serious about beekeeping and produce innovative products. - Inability to produce honey in enormous quantities for export at a better price. - Reluctance among beekeepers for collaborations. - The plan for aid framed by National Apiary Program prepared by the Ministry of Agriculture could be more generous. The budget could/should be reconsidered along with the altitude restrictions. 	<ul style="list-style-type: none"> - Exported bee packages death because of airlines negligence. - Lack of control over products and contamination of some products with chemicals. - Lack of approved treatments for bee diseases. - High production costs. - Weak cooperation between the private and governmental sectors. - Non effective agricultural advisory, training, and poor communication with research centers. - Lack of experience in applying for structural funding and inability to handle administrative documents. - Difficulty marketing bee products. - The average size of apiaries is small. - Lack of pure and certified bee queens. - Lack of scientific knowledge for beekeepers.
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Weakness		
<u>Lebanon</u>	<u>Palestine</u>	<u>Sardinia</u>
<ul style="list-style-type: none"> - -Size: Most beekeepers are small with low profitability - -Pesticides: High use of pesticides, is fatally damaging bees and reducing honey production - -Inputs: high cost of beekeeping inputs that lead to high-cost production (sugar, candy, treatments) - -Low selling price: Due to economic crisis that hit Lebanon that reduced the purchasing power, - -Lack of exports: Due to diplomatic crisis with some Gulf countries, export decreased drastically. - -Import of low-quality cheaper honey - -High cost of transportation: - -Low consumers awareness: Most of Lebanese Consumers have low 	<ul style="list-style-type: none"> --Weak /absence of development research of this sector -Absence of breed and queen development center -Limited areas as pastures -Drought /diverse weather conditions -Un availability of local inputs with affordable prices - High production cost – most inputs imported from Israel - Low productivity. -Weak/absence of control over resources -The absence of an organizational structure for breeders and producers that protects them. 	<ul style="list-style-type: none"> -High climate dependency -Prone to adulteration -Reduced use/diffusion of quality and origin certifications -Hobbyists often indistinct from professionals



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<p>awareness about honey quality, criteria, standards, and norms.</p> <p>-Lack of online marketing: The great majority of beekeepers do not profit from online marketing advantages</p> <p>-Stagnant yield of honey: medium to large scale farmers are suffering from difficulties in selling their honey production</p> <p>-Low Productivity: hobbyist and small beekeepers, are characterized by low productivity.</p> <p>-Climate variation:</p> <p>-Dwindling of bee pastures:</p> <p>-Lack of pollen origin test:</p> <p>-Lack of disease identification LAB:</p> <p>-High cost of tests:</p> <p>-Non-registered brands and unbranded honey</p>	<ul style="list-style-type: none"> - Low experience of small-scale beekeepers -Diseases and pests -Lack of laboratories to detect diseases and check the quality of honey. -Unmanageable, intensive, random use of insecticides and herbicides -Marketing 	
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Despite the high number of weaknesses noted in the targeted countries many opportunities were identified and are considered sometimes specific to their country of origin but sometimes useful for others to boost their beekeeping sector. The creation of partnership between beekeepers operating in the same area raised by in the Cypriot & Lebanese studies can be a good opportunity for all partners countries. The diversification in products perceived by Cypriot and Egyptian partners and the importance of innovation in the sector noted by Sardinia study are good opportunities to boost this sector. In addition, the need to empower youth generation can constitute a long-term power opportunity in all partners countries (Table 4).

Table 4 : Comparison of opportunities in the five countries covered by the project.

Opportunities



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<u>Cyprus</u>	<u>Egypt</u>	<u>Lebanon</u>	<u>Palestine</u>	<u>Sardinia</u>
<ul style="list-style-type: none"> - Creation of partnership between beekeepers operating in the same area. Join treatment of the problems of their area - Ability exploit the Cypriot nature as it is, in order - Support for young beekeepers who have more knowledge and appetite to engage in beekeeping and raise the sector to higher level. 	<ul style="list-style-type: none"> -- Producing early bee packages makes us competitive. - Opening new markets, and diversity of the products that honey enters its components. - Most of rural population considering beekeeping as a good income job. - Working with strategic partners in the industry environment. - The government financial policies support exportation. - Training workshops for beekeepers. - Honey has social acceptance as a food and pharmaceutical product. - Small apiaries are the backbone of the rural economy. 	<ul style="list-style-type: none"> -Interorganizational cooperation between private and public sectors -Potential for export boosting: -Increase Local market: -The phenomenon of returning to agriculture 	<ul style="list-style-type: none"> - Important and promising productive sectors in the agricultural production system and necessity to support beekeepers, to support their steadfastness on their land. - International support through many projects /programs - Regional demand on Palestinian honey 	<ul style="list-style-type: none"> - New entrants and youth interest - Space for innovation

Threats identified in the five partners countries exposes the following (Table 5):



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- The main threat identified in all countries concerns the adulterated Honey and the import of low-price honey who compete with local production and reduce the power of marketing, this threat worsens in Lebanon & Egypt where changes in currency prices is predominant.
- Climatic change was considered an important threat for Egyptian & Sardinian partners.
- The restriction of bee pasture was noted in Cyprus, Lebanon & Palestine and constitute a big problem for the withering of this sector.
- Lack of policies are considered an essential threat in Egypt, Lebanon & Palestine. These countries need to apply existing policies or formulate new one to protect their sectors.

Table 5: Comparison of Threats in the five countries covered by the project.

Threats				
<u>Cyprus</u>	<u>Egypt</u>	<u>Lebanon</u>	<u>Palestine</u>	<u>Sardinia</u>
<ul style="list-style-type: none"> - Imports of honey from other EU countries at a very low price. - The beekeeping areas are slowly condensed. They are destroyed by fires or threatened by residential development. Areas destroyed by fires are not reforested with apiculture plants. - Exacerbation of diseases and enemies that afflict bees and inability of a large number of beekeepers to identify them on time and cope with them. 	<ul style="list-style-type: none"> - Random use of pesticides. - Raw materials increasing prices. - Market monopoly by companies and the ferocity of competition. - Negative changes in currency prices - Governments apply certain policies that restrict investors - Problems of climate change. - Insufficient risk management skills. - Import cheap honey and adulterated honey - Different export specifications of countries. 	<ul style="list-style-type: none"> -Low quality Honey import: - Lack of honey import regulations - Risk of beekeeper withdrawal - Risk of more severe pasture dwindling - High cost of varroa mite treatments - Absence or lack of enforcement of laws concerning the import and use of pesticides - Lack of policies: Since the policy presented by bee association and syndicate does not approve yet 	<ul style="list-style-type: none"> - Pests and diseases - Israeli restrictions: Violations of the occupation - Smuggled and adulterated honey - Weak Control over the Palestinian markets - unfair competition 	<ul style="list-style-type: none"> -Climate change - Inexperienced new entrants -Strong pricing competition by uncontrolled foreign productions

6. The region's product portfolio on honeybee products and the honey types available

The Beekeeping sector is considered a promising sector and had many intersections with other sectors such as agriculture, environment, economy, and tourism. As explained, honey is the main product of this sector; but there are derivatives products that can be produced within the beekeeping sector. In the five partner's countries the biodiversity variation enable beekeeper to produce a large range of products variable between countries. The table 6 summarize the type of Honey produced in each of the targeted countries.

Mono-floral Honey is leading in Egypt where agricultural lands is predominant, while in other countries there is a predominance of multi-flora honey where bees are fed on wild vegetation. In addition, non-floral honey Honeydew honey, produced from the secretion of plants, is specific for Lebanon and Palestine as well present in Sardinia, the main characteristic of this type of Honey is not affected by crystallization. A wide range of honey is produced in Sardinia (12 types of honey), In Lebanon and Egypt 7 types of honey were identified and just 4 types were noted in Cyprus.

As discussed, earlier Pollen, Propolis & Royal Jelly are produced in marginal quantity if compared to honey production. COVID-19 pandemic impower the production of propolis in some countries due to its characteristic to boost immune system. Pollen is produced by beekeepers in the targeted countries for two purposes: to be sold in the market or useful in winter and summer season in some areas to add proteinic supplement to beehives. Royal Jelly & Propolis in addition to their direct use by consumer serve for cosmetic preparation.

Venom, used in the pharmaceutical industry, and more recently it became popular in the beauty industry, which branded it as a natural Botox is produced in limited quantity for research purposes. If developed, the production of venom can constitute a good potential as supplementary income for beekeepers in the future.

Swarm are produced and sold by some beekeepers locally in their countries, while destination of bee packages produced in big quantity in Egypt and marginally in Lebanon focus only on foreign markets. In other hand bee wax is used locally in all country but Egypt exports a significant quantity of this product.

Table 6 : Different types of honey produced in the five countries of the project

Country	Type of Honey	Name of Honey
Cyprus	Mono-Floral	Citrus Honey
		Eucalyptus Honey
	Multifloral	Thyme Honey
		Carob Honey
		Fragrant Honey
Egypt	Mono-Floral	Clover Honey
		Sunflowers Honey
		Hijazi Honey Alfalfa
		Citrus Honey
	Multi-Floral	Cotton Honey
		Sidr Honey
		Black seed Honey
Lebanon	Mono-Floral	Citrus blossom honey
	Non-floral honey	Oak Honey
		Cedar Honey
		Juniper Honey
	Multi-Floral	Mountain Honey “Jerdi”:
		Eucalyptus honey
Palestine		Multiple-flowers Honey
		Extra honey: premium grade honey.
		First-class honey
Sardinia	Mono-Floral	Second-class honey
		Citrus fruit honey
	Multi-Floral	Mediterranean Scrub Honey, Sardinian
		Wildflower Honey
		Strawberry tree honey or bitter honey
		Asphodel honey
		Thistle Honey
		Eucalyptus Honey
		Honey of cistus
		Wild Lavender Honey
Chestnut Honey		
Acacia Honey		
Honey from sulla		
Rosemary Honey		

7. Marketing and packaging

Marketing strategy customized in Cyprus is the most important between the five partners' countries where a trademark of Cypriot honey was established in 2019. The trademark is a golden hexagon (Honeycomb shape) with a foil effect (foil printing) and in the middle it has the shape of Cyprus with a bee on top. The trademark indicates the quality and authenticity that defines Cyprus honey, and this is applied to 100% honey produced from the nectar of Cyprus flowers and verified through strict authenticity and quality checks carried out by the state.

The trademark created in Cyprus is a strong marketing asset and could be promoted and used at its full potential not only for the market of Cyprus but also internationally. This initiative can be generated and duplicated in the other partners countries which help to create an identity for each country and as a tool useful to empower the beekeeping sector in general and small and medium scale beekeepers who showed during studies a difficulty in marketing, since in Egypt & Palestine beekeepers suffers from the lack of marketing locally.

There is very little marketing activities undertaken in Lebanon and most of the honey produced by the beekeepers is sold directly to customers who appreciate its quality and authenticity, therefore no national marketing strategy were undertaken in place to stimulate the demand for honey; we just note a regional initiative undertaken by the Chamber of Commerce, Industry and Agriculture in the north in collaboration with international NGOs to collect, test and follow traceability of the honey produced in order to gain confidence of consumers at national and international market.

In Sardinia, a national trademark does not exist, but marketing channels explained in the study seems very developed by private sector where some brands are leader in the market and possess some innovations in labeling & packaging for conventional and organic production as well small-scale beekeepers can profit from e-commerce platform or through retailers to sell their products. In additions wholesale is recommended to professional beekeepers with a large number of hives who prefer to invest their time only in the beekeeping activity and who have no interest in selling their honey under their own brand.



Packaging & Labeling, an essential element of promotion and image of a product is well developed in Sardinia & Lebanon but still need more attention and development in Cyprus, while Egypt and Palestine need additional works of packaging and labelling to promote their production since of beekeepers are selling unbranded products

8. Regional tourism products and services based on the honeybee

In addition to beehive products, honey, pollen, wax, propolis..., several attractions emerge for ecotourists who adore nature and healthy ecosystems, for educational tourism for young students, for healthy treatments with beeswax products, as well as entertainment tourism at fairs and honey festivals showing and commercializing beehive products.

Cyprus is a world-renowned tourist destination for many decades and tourism in one of the main products of the country and throughout most of the later decade has represented a percentage of 20% of the GDP. Local organizations, beekeepers and other individual started offering new products to internal and external tourists for example: specific routes for honey tasting, showing tourist who to be a beekeeper, who to tent to bee, how to make candles and cosmetics... In addition, to the organization of many bee festivals.

Despite that Egypt's economy relies heavily on tourism as one of its primary economic sources, the study conducted in Egypt reveals that apitourism does not exist in the country, therefore numerous initiatives have lately been launched to promote the culture and benefits of bee products. Among them Egypt honey festival launched for the first time in 2019 under the sponsorship of the Ministry of Agriculture, Ministry of Environment, Council of Arab Economic Unity, and Arab Beekeepers Union, with the aim of becoming a global leader.

Situation in Palestine show the absence of apitourism.

In Lebanon, some initiative of apitourism started recently related to biosphere. For example: Chouf biosphere has introduced the beekeeping tourism within its touristic program, showing the tourist and the naturalists the beehives with some educational explanation about the beekeeping sector, the bees, and the honey. In addition to the organization of a regional beekeeping festival.

In Sardinia, many fairs and events related to the artisanal sector of bee products are held. For example, in Guspini who is been included among the honey towns recognized by the world of Italian beekeeping, the city of Monti is famous in the world of honey as the 'capital of bitter honey, the Montevecchio honey festival is another important tourist opportunity of the Sardinian summer,



In addition, the small towns of Sardinia host ethnographic museums considered small jewels, such as the Flumini Maggiore Windmills Museum with a small collection of traditional rustic cork beehives, and the entomological exhibition inside the village of Ingurtosu where visitors can discover ancient beekeeping traditions.

9. Honey in the local/ traditional gastronomy

Data collected showed that honey is still a basic element in the cuisine of the five partners countries. It is mainly used as a healthy alternative to sugar in coffee and tea

In Cyprus honey is typically used during breakfast on toasted bread, over yogurt with sprinkled nuts on top, over fresh unsalted anari (a local soft white mascarpone-like cheese). In more modern versions of starters and desserts one can drizzle honey over grilled Halloumi cheese. Some of the most known Cypriot's traditional foods that use honey are: Pishies (Deep fried pastry dessert filled with cinnamon and sugar, served with honey and crushed almond), Pastellaki (Crunchy and sweet snack, made with honey and sesame seeds) and Grapes must cookies with honey. As well, honey is used in Cyprus in savory recipes. It can be used in sauces for any dish and in salad dressings most commonly for Pork pancetta with thyme honey, Gigantes (butter/giant beans) with honey in the oven and Anarokrema (cream made with anari) with honey and walnuts.

In Egypt, addition to its use for therapeutic cases, honey is used sparingly in the production of oriental sweets such as baklava, konafa, or pies, as well as other sweets such as nuts in honey, candies, chocolates, cakes, muffins, pizza, and cookies. In some instances, it is used in cooking, particularly with meat and poultry, to preserve the moisture of tissues and impart more taste. Restaurants in Egypt have recently substituted honey for white sugar on their menus.

For most of Lebanese consumers, honey is not just a food, they consider it as natural medicine and remedy for throat pain and cough calmer. Mixed to royal jelly, it is used by several men to prevent prostate and/or during prostate treatment. Honey is used with tisane which is highly consumed in winter, and with fruit cocktail and cream (kashta). As well, it is used in some Lebanese sweets such as "semesmieh" and some cake-like sweets (sfouf) instead of sugar and sugar syrup as healthy sweetener, and many other recipes such as mafroukeh, nammoura, banana jam.

In Sardinia, honey is used in traditional medicine as a sleep inducer, cough sedative and anti-diarrheal and could also be anti-tumoral. In addition, one of Italy's most ancient foods is Abbamele or Abamele, produced exclusively in Sardinia. Abbamele is obtained from honeycomb, honey, and bee pollen. Honey is manually extracted from the honeycombs and the honeycombs are



crumbled and dipped into warm water. Once melted, the wax is separated from the honey and pollen and the remaining syrup is heated for the caramelization of sugars. Abbamele can be eaten with cheese, fresh fruit, or even pasta or vegetables.

11. Needs and expectations of the local honeybee MSMEs and the people in building up a bee-business

To better understand needs of the beekeeping sector in the targeted areas, many questions were asked for stakeholders in each country aimed at uncovering problems and needs in their most practical aspect.

The main purpose of this section is to identify shortcomings, areas for improvement, causes of discomfort or inefficiency, or more generally elements that may affect the genuine development of business related to the sector, but also to find opportunities on which to intervene later through targeted actions.

Similar problems and needs were identified in different countries and are summarized as follows:

- Beekeeping sector was considered with high sustainability in Lebanon since 85.4% surveyed beekeepers in Lebanon showed an interest to improve their business. In contrary, 83.3% of Sardinian beekeepers perceived the future survival of their company uncertain.
- Climatic changes considered as a growing problem worldwide, was considered the most significant problem confronting beekeeping in Egypt, Palestine, and Sardinia
- Needs to improve communication and advertising was revealed particularly important in all targeted countries and the web portal activity will solve partially this problem. adulterated and smuggled honey are focal criteria that handicap the marketing of the beehive product.
- One of the main issues identified by the surveyed stakeholders in the five targeted countries was the lack of supports from institutions.
- Shortage of bee pasture is the major constraints of the sector in the five projects' countries. It is due to uprooting of trees in Sardinia, and Lebanon. As well, in Lebanon the over grazing of bee pasture by small ruminants affects negatively the productivity. Palestinian partner linked this shortage to the occupation restrictions and violence induced by Israel.
- Application of pesticides is considered as main concern of beekeepers in the targeted countries



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- Disease and pest control are crucial factors to the sustainability of the apiaries in the five countries covered by the project. Its need a lot of attention to decrease the prevalence of Varroa and Nosema.
- The theft of bee boxes/colonies was noticed in Palestine & Lebanon (faced by 55.1% of the respondents).
- Lack of center producing certified queen bee was noted in Egypt and Palestine
- The absence of specialized laboratories in Lebanon and Palestine aiming to identify the origin of the honey and detect adulterated honey is missing

In addition, there is a need to enhance the competences of farmers in terms of: e-commerce in order to improve the marketing of their products; the production of add-value products such as: venom, royal jelly, propolis, cosmetics, ... which help to diversify production; train beekeepers on identification of honeybee diseases and new methods of treatments; new strategies and methods to combat climate change, particularly heat and cold waves; apitourism in order to create additional income for beekeepers in rural areas; finally the introduction of new cooking formulas with honey and honey-based goods.

Conclusion

This report intends to offer a regional comparison on the economic value of networking around honeybees' products in the five targeting Mediterranean countries and providing a multiple step analysis.

Starting from a general overview, it is very clear that the beekeeping sector is promising, but it needs institutionalization and support in the targeted countries which can contribute to increase the local national production through honey as a primary product, and many other secondary products in this sector. Doing this may generate millions of dollars if they invested correctly and directed in accordance with tight policies and enforceable legislative framework.

The administration of a questionnaire to actors in each country aimed to study a regional photography about the sector and the need linked to the most relevant problems found at Mediterranean and national level. Survey's results helped to elaborate a SWOT analysis in each country and when compared between countries this analysis reveals some strength highlighted in some areas useful for other geographic location. For example: as noted before the marketing strategy originated in Cyprus can constitute a lesson-learned for the other countries, the apitourism initiatives observed in Cyprus, Lebanon and Sardinia should represent a good example for other countries. In addition, this analysis gave a strategics tools to decision makers in each country to address challenges and identify site of improvement of the sector and highlight the wrong practices in bee management, where correction is necessary to increases the environmental balance and productivity.

All obstacles distinguished in each area can turn into opportunities, and their solutions can be a breakthrough in the establishment of a prosperous sector at regional level in the future. Decision-makers can overcome the obstacles that may face this sector in the future which constitute a good opportunity of development in rural areas.

Finally, data provided in this study give a panorama of the beekeeping sector in each targeted region and at Mediterranean level in general and raise similarities & differences useful for improvement of this sector.



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