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# Value chain analysis of (greenhouse) vegetables in Lebanon

Strengthening Lebanese Water and Agriculture Sector  
Component 5: Adaptive greenhouse; Work package

Marc Ruijs



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This study was carried out by Wageningen Economic Research and was commissioned and financed by the Dutch Ministry of Foreign Affairs within the context of the 'Chain analysis & Market outlook' research theme

Wageningen Economic Research  
Wageningen, November 2017

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MEMORANDUM  
2017-102

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Ruijs, Marc, 2017. *Value chain analysis of (greenhouse) vegetables in Lebanon; Strengthening Lebanese Water and Agriculture Sector; Component 5: Adaptive greenhouse; Work package.* Wageningen, Wageningen Economic Research, Memorandum 2017-102. 28 pp.; 8 fig.; 4 tab.; 8 ref.

This study analyses the value chain of vegetable crops from (adapted) greenhouses. Because the Lebanese greenhouse sector is facing several bottlenecks, the following recommendations can be made to improve the competitiveness of the value chain: the professionalisation of the value chain; stimulation of collaboration; improvement of the agricultural knowledge and information system; strengthening of the linkages between the public and private sector; a focus on the high-end domestic and international market; and the production of high quality products in off-season periods for the international market.

Key words: value chain analysis, Lebanon, greenhouses, vegetables, product potentials

This report can be downloaded for free at <https://doi.org/10.18174/425924> or at [www.wur.eu/economic-research](http://www.wur.eu/economic-research) (under Wageningen Economic Research publications).

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Wageningen Economic Research Memorandum 2017-102 | Project code 2282200313

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# 1 Introduction

Within the project 'Strengthening the Lebanese Water and Agricultural Sector', component 5 focuses on the introduction of adaptive greenhouse concepts in Lebanon. The aim is to improve the water use efficiency of greenhouse horticulture, to improve the production and quality and to offer labour opportunities for both the Lebanese population and the Syrian refugees. The purpose is to set up a demo centre with greenhouses adapted to the local conditions in order to show the possibilities and their performances. Greenhouses offer the possibility to produce qualitatively better products and to deliver products year-round. This offers perspectives to supply to specific market segments and to achieve better market prices, both on the domestic market and export market.

In the adaptive greenhouse approach a supply chain and market analysis is one of the activities. The aim of this study is to analyse the value chain of vegetable crops from (adapted) greenhouses. The value chain analysis will focus on vegetables crops, because flower production in protected cultivation is still limited in volume. Some of the questions to be answered will be:

1. Which vegetable crops are most appropriate for greenhouse production?
2. In which markets (domestic and export) will the products get the best market prices? and
3. Which requirements do those products have to meet?

The value chain analysis also includes trends, bottlenecks and opportunities.

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## 2 Method

The adaptive greenhouse concept means that the design of the greenhouse production system is adapted to the regional conditions with respect to climate, natural resources, markets and economics.

First, a desk study was conducted based on existing reports of value chain analysis (VCA) of fruits and vegetables in Lebanon. These VCA reports were based on studies conducted by USAID, ILO, Mercy Corps and CBI. In addition, the Agricultural Census 2010 of the Lebanese Ministry of Agriculture was a main data and information source, although somewhat dated. And, finally, data from FAO and Comtrade were collected, but these data are only presented at national level and not at regional level. Moreover, information was gained from the visit report of Van der Salm and Van Os (2017) during their stay in March 2017 as part of the inception phase. Van der Salm and Van Os are representatives of Wageningen Plant Research / Business Unit Greenhouse Horticulture and leader of component 5 (WP5).

Second, via the quartermaster of the overall project (Strengthening Lebanese Water and Agriculture Sector) – Mr. Winfried Pietersen of PietersenConsult – interviews were arranged with different stakeholders along the supply chain (see Appendix I). The interviews cover topics like production, input and market prices, suppliers, services and training, transport, storage, trade and problems & challenges faced.

Moreover, a wholesale market, a local market and supermarket Carrefour (representing a price-quality supermarket) were visited to get an impression of the type, price, origin and presentation of (greenhouse) vegetable products.

As mentioned before, the focus in this value chain analysis is on vegetables from greenhouses. Because detailed data and information of greenhouse vegetables are scarce, only indications or estimations were recorded from the interviewed persons.



## 3 Current situation

### 3.1 General information

Lebanon has six main crop production regions. Vegetables are produced mainly in four regions: coastal area, North Lebanon/Akkar plain/upper Mount Lebanon, Bekaa valley and the Mountain regions (see Figure 3.1). The other two crop regions are the Western slope of Anti Lebanon and Southern Hills.



**Figure 3.1** Map of Lebanon

Source: Decanter.com.

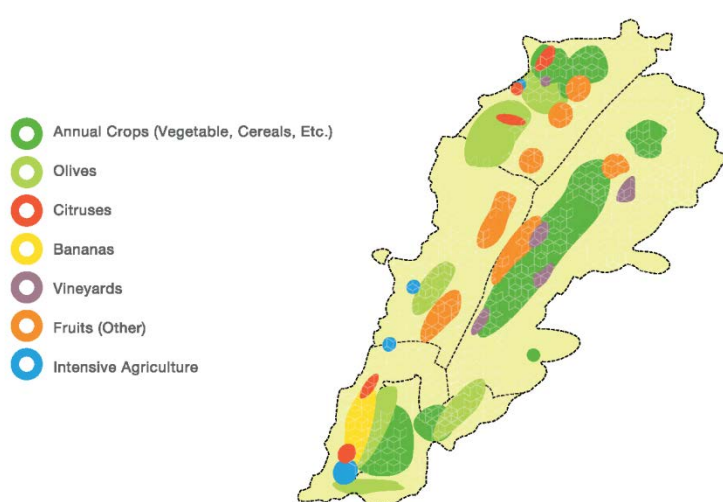
The Mediterranean and moderate climate in Lebanon, the soil fertility and availability and quality of water are favourable for (fresh) vegetable production. Especially the Bekaa and North Lebanon (Akkar) have a good soil texture and provide a great potential for field crop and intensive cultivation (IDAL, 2017). Due to different micro-climatic zones and the use of greenhouses (tunnels), a wide diversity of vegetables can be produced during the whole year.

Unfortunately, no reliable statistics of crop production area of vegetable crops are available. The agricultural census 2010 of the Lebanese Ministry of Agriculture shows that the total crop area is estimated at 232,200 ha. About 54% of the total crop land area is cultivated with permanent crops (about 126,000 ha), 44% with temporary crops (about 102,500 ha) and 2% is covered with greenhouses (about 3,800 ha). Vegetables are the second largest category within the temporary crops with almost 37,000 ha. The Bekaa valley has the largest vegetable production area (about 37%), followed by the regions Baalbeck-Hermel and Aakkar (see Table 3.1).

**Table 3.1** Major temporary crops by categories per mohafaza/district (Agricultural census 2010)

7 Major temporary crops by groups (ha)					
Mohafaza	Cereals	Pulses	Vegetables	Fodder crops	Industrial crops
Mount Lebanon	72	430	1,539	0	36
North	815	529	1,130	19	203
Aakkar	9,141	1,794	7,657	305	1,705
Bekaa	15,593	1,942	13,518	873	109
Baalbeck-Hermel	13,205	3,530	9,704	210	3,494
South	1,897	393	1,165	23	1,285
Nabatiyeh	4,201	836	2,064	189	2,867
Lebanon	<b>44,924</b>	<b>9,452</b>	<b>36,776</b>	<b>1,620</b>	<b>9,699</b>

According to IDAL (2017) vegetables comprise up to 63% of the total crop production in 2014, followed by fruits (31%).



**Figure 3.2** Agricultural map of Lebanon IDAL, 2017.

The main vegetable products in 2013 from open field and protected cultivation are potatoes (405,000 tonnes), tomatoes (320,000 tonnes), cucumbers and gherkins (175,000 tonnes), onions, garlic and leeks (100,000 tonnes), lettuce and chicory (58,000 tonnes) and eggplants (44,000 tonnes) (CBI, 2016). According to FAO, the production volume figures are lower with the exception of potatoes (see Table 3.2).

**Table 3.2** Production volume of vegetables in Lebanon 2010-2014

Production vegetables in Lebanon (tonnes)					
	2010	2011	2012	2013	2014
Chillies and peppers, green	26,389	23,440	14,728	15,781	16,185
Cucumbers and gherkins	183,224	146,764	128,272	130,837	129,861
Eggplants (aubergines)	54,975	41,218	27,164	26,317	25,202
Lettuce and chicory	70,629	73,635	36,527	36,784	37,709
Tomatoes	281,117	279,942	274,028	273,766	274,372

Source: FAO, 2017.

Table 3.2 shows that the production volumes of most vegetable crops have decreased between 2010 and 2014. Only potatoes have had a large increase and the production volume of tomatoes was more or less stable. The development of the production volume follows to a large extent the development of the production area (see Table 3.3). As Table 3.3. also shows, the production area of most vegetable crops has decreased. Only the area of potatoes has expanded. An explanation for the decrease in production of horticultural crops and in particular fresh produce is the Syrian crisis (ISIS). For potatoes, a longer route to export markets is less problematic than for fresh produce. As mentioned before, caution has to be made, because reliable data are not available.

**Table 3.3** Production area of vegetables in Lebanon, 2010-2014

Area vegetables (ha)	2010	2011	2012	2013	2014
Chillies and peppers, green	809	705	417	428	422
Cucumbers and gherkins	4,175	3,461	3,066	3,137	3,124
Eggplants (aubergines)	2,072	1,557	1,043	1,005	958
Lettuce and chicory	2,592	2,700	1,392	1,391	1,417
Tomatoes	4,383	3,601	3,535	3,460	3,399
Potatoes	11,131	11,500	12,000	15,800	17,352

Source: FAO, 2017.

On a total of 232,000 ha of crop land, about half (113,000 ha) is irrigated. There are almost 170,000 agricultural farms with an average cultivated area of 1.4 ha. About 70% of the farms are smaller than 1 ha, 26% is between 1-6 ha and 4% have more than 6 ha (MoA, 2010). The majority of the agricultural holdings are located in North Lebanon (31%), in the Bekaa (20%) and in Mount Lebanon (19%) (IDAL, 2017).

About 98% of the agricultural farmers are older than 52 years (MoA, 2010).

Looking at the supply calendar, we see that some Lebanese vegetable products are supplied year-round, like tomatoes, cucumbers, potatoes and onions, while lettuce and iceberg are not supplied between January and April (CBI, 2016). Products are both meant for domestic and export markets.

## 3.2 Greenhouse vegetables

According to the Agricultural census (2010), about 3,800 ha of greenhouses are used for horticultural production (2% of total crop land). The greenhouses mainly consist of plastic single tunnels (low and high tunnels). A small part has a multi-tunnel greenhouse (2-3 bays). The first greenhouse was introduced by Robinsonagri in the 1970's with a glass cover (Personal info from Robinsonagri, 2017).

Greenhouses are mostly located in the Aakkar region (1,574 ha), the South (628 ha), Mount Lebanon (525 ha) and the North (477 ha). In the Bekaa valley only a small area of greenhouses is found (86 ha), because of the hot summer. Almost all greenhouses in Lebanon are used for vegetable production. At this moment the area of greenhouses is estimated at 3,900 ha (info from Robinsonagri and NATAGRI, 2017).

A typical single tunnel is 8 m wide and 41.5 m long (about 330 m<sup>2</sup>) and has passive ventilation. Next to this type also adapted tunnels occur, which have double doors and side nets for extra (active) ventilation. Larger greenhouse will need active climate control to prevent unfavourable greenhouse climate conditions.

Vegetable crops cultivated in greenhouse are tomato, cucumber, pepper, eggplant, lettuce and iceberg. Under greenhouses year-round production is possible, but in some regions the greenhouses are temporary not being used due to warm/hot temperatures during summer.

Data about production and area of greenhouse vegetables are lacking. For tomatoes, the area of greenhouse production is estimated at 43.7 ha in the Bekaa valley (MercyCorps, 2014). According to Robinsonagri, 2017 the greenhouse area is increasing steadily. In the Northern part the increase of greenhouse area is 5% per year and in the Bekaa there is a fixed increase of 2% per year. In the South the greenhouse area is stable, but there is a shift taking place from single tunnel to multi-tunnel greenhouses. Most greenhouses (about 90%) are still traditional and mainly for vegetable production.

In general growers are risk averse when it comes to investing in technology, because of uncertainty about the product prices.

The cultivation season in greenhouses differs from region to region, but mostly there are two cultivation seasons from March till mid-August and from early September to December. A long cultivation season starts in September and ends in June the next year, like in the coastal area and the North sand upper Mount Lebanon.

### 3.3 Trade – exports and imports

#### Export

The total export of fresh vegetable products amounted to more than €59 million in 2014 (see Table 3.4).

**Table 3.4** Lebanon fresh vegetable exports (HS07): main products (in 1,000 euro)

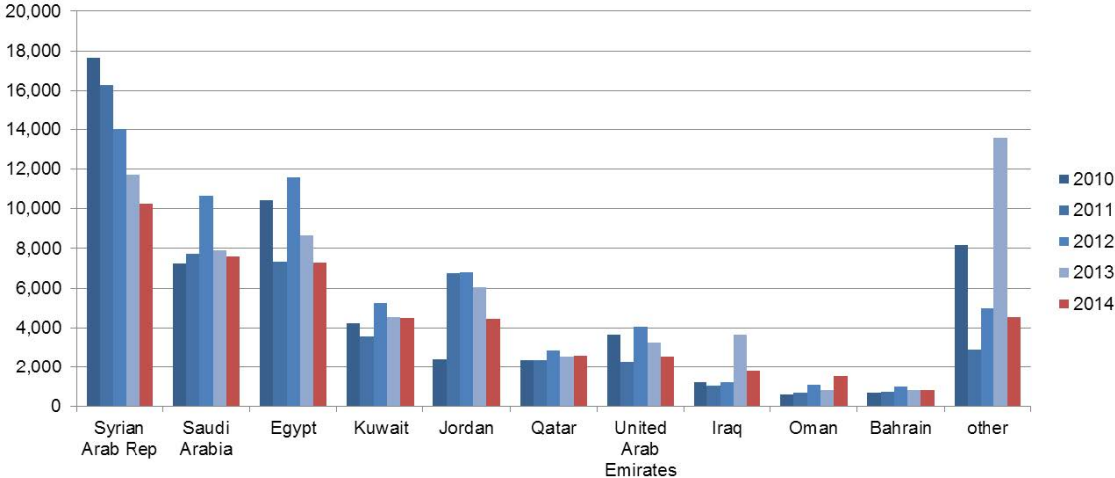
Code	Product label	2011	2012	2013	2014	2015*
	Total fresh vegetable exports	32,144	31,008	49,989	59,344	95,398
070190	Fresh or chilled potatoes (excluding seed)	14,837	12,118	27,629	36,694	56,278
070511	Fresh or chilled cabbage lettuce	4,887	6,402	8,857	2,538	12,396
070390	Leeks and other alliaceous vegetables	3	2	-	1	6,908
071350	Dried, shelled broad beans and horse beans	683	252	381	586	2,941
070999	Fresh or chilled vegetables n.e.s.	-	1,858	1,497	1,515	2,784
070110	Seed potatoes	157	-	-	1	2,776
070310	Onions and shallots	2,113	1,355	2,782	3,048	1,792
070820	Beans	230	307	349	349	1,587
070200	Tomatoes	546	811	1,126	1,085	1,504
070490	Cabbages, kohlrabi, kale and similar edible brassicas (excl. cauliflowers)	113	103	249	128	1,240
070700	Cucumbers and gherkins	337	532	550	647	680
070930	Aubergines 'eggplants'	322	430	385	391	538
071320	Chickpeas	571	352	297	287	524
071420	Sweet potatoes	-	1	11	2	505
071340	Dried, shelled lentils	429	414	337	418	490
071290	Dried vegetables and mixtures of vegetables	95	142	288	342	310
070810	Peas	57	98	111	286	300
070890	Leguminous vegetables	108	264	193	331	265
070960	Capsicum or pimento	296	282	301	310	258
070993	Pumpkins, squash and gourds	-	289	286	302	135

CBI, 2016. \* 2015 data based on partner reported data and seems not accurate; source Trademap (2016).

Colour coding: green = increasing (min. 10% per year); black = stable, red = decreasing (min. -10% per year).

Table 3.4 shows that Lebanon's export value of fresh vegetables has grown substantially since 2011. The main export products are potatoes (59% of fresh vegetables exports), cabbage lettuce (13%) and leeks (7%); the large export amount in 2015 in comparison to previous years is not supported by other

data). When we look in particular at greenhouse vegetables, then the main export products are cabbage lettuce, tomato, cucumber & gherkins and eggplants. The export of Lebanese vegetable products mainly goes to the Gulf region (see Figure 3.3).



**Figure 3.3** Lebanese vegetable exports (HS08) to the main markets, in 1,000 euros (CBI, 2016)

*Import*

The Lebanese import of fresh vegetable products has decreased slightly since 2011 and amounted to more than €89 million in 2015 (CBI, 2016). The main imported vegetables are potatoes (15.9% of total fresh vegetable imports), seed potatoes (15.7%), chickpeas (11.4%) and garlic (9.8%). Potatoes come mostly from Egypt, chickpeas from Mexico and the USA and garlic from China. The export of potatoes is about four times higher than the import of potatoes (seed potatoes excluded). Differences in cultivation schedule between Lebanon and the exporting countries is one of the reasons for the high volumes of exports and imports of potatoes.

Typical greenhouse vegetables like tomatoes, lettuce, cucumbers and eggplants are also imported, but in limited quantities.

Lebanon is a net importer (in value) of fresh vegetables, although in 2015 export and import of fresh vegetables seemed more or less equal.

# 4 (Greenhouse) Vegetable value chain

## 4.1 Overview

The actors in the supply chain are the producers, dammans (middle to large-sized vegetable farms), middlemen, wholesale market, wholesaler/distributor, packer/exporter, processor and local retail in Lebanon and importer/wholesaler, re-packer and retail/foodservice in foreign countries. Figure 4.1 gives an overview of the supply chain from Lebanese producer to local and international consumer.

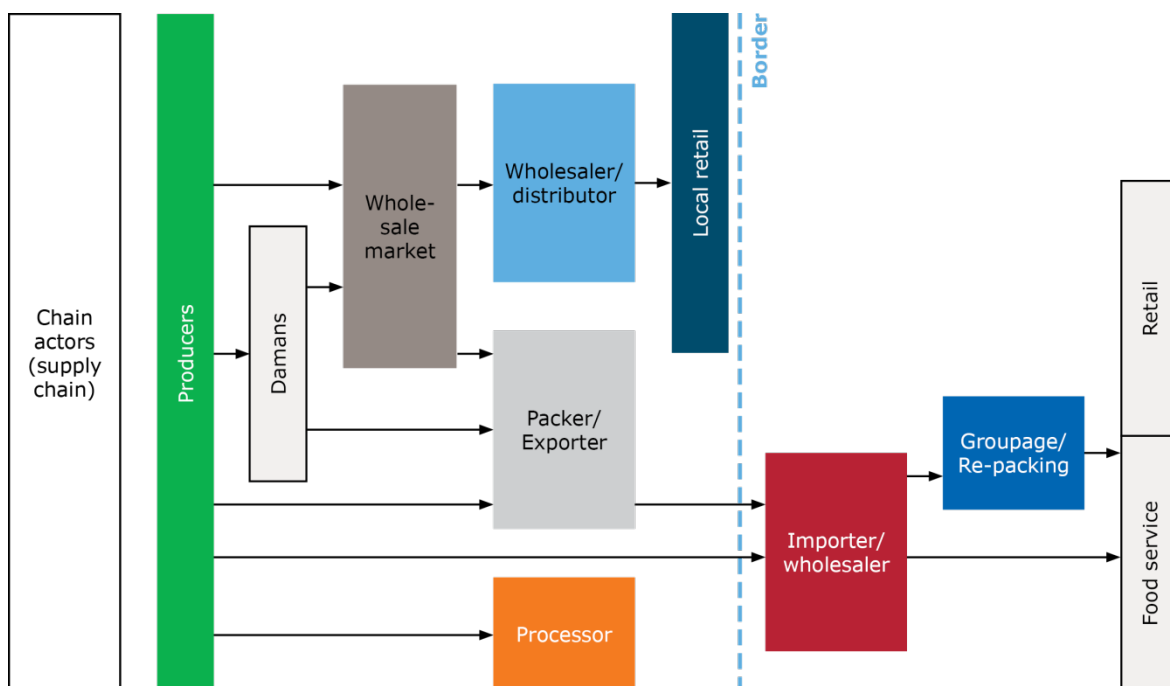


Figure 4.1 Vegetable value chain map (adapted from CBI, 2016)

The value chain map and the importance of the different channels differs per product as the report of CBI (2016) has shown for several fruit and vegetable products.

For fresh greenhouse vegetables in particular the role and importance of processors are limited, because almost all fresh vegetable products from greenhouses will be distributed and sold unprocessed.

In the next paragraphs the supply chain actors will be discussed subsequently and in particular with regard to greenhouse vegetables.

## 4.2 Producers

The vegetable farms vary in dimension, from small to large. The average size of a farm was 1.36 ha in 2010 (Ministry of Agriculture, 2014). In most farms open field and protected cultivation are combined. Only a limited number of growers are specialised in greenhouse production. An actual number of greenhouse growers is not available. The total area of greenhouse area is estimated at 3,900 ha (info Robinsonagri and NATAGR, 2017). Because of the increasing demand for high quality and high value

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fresh vegetable products, it is to be expected that the greenhouse area will increase steadily depending on the global economy and the geopolitical situation in the Middle East region.

Smaller and medium-sized growers sell their products to dammans and middlemen. Dammans are large or medium-sized farmers who collect or purchase products from other growers in their region and sell them at wholesale markets to wholesalers and exporters. In some cases the dammans themselves are distributor or exporter. The damman system is more common for fruit products.

Middlemen do not buy the products themselves, but store, (re)pack and sell them to the client. At a later moment they pay the producer, depending on the results of the negotiations. The producer is more or less dependent on the middlemen for the price he gets for his products and so he is in a weak position. On the other hand, the middlemen try to keep the situation satisfactory for everyone, otherwise the producer will switch to other middlemen or wholesalers. The role of the middlemen is being discussed, because there is little incentive for small growers to modernise their greenhouse farms.

Small farmers own or rent land for vegetable production. Growers who own land, or have long rental arrangements through family ties, have greenhouses. Growers who rent land on a yearly basis do not take risks in investing in greenhouses. Small growers in some regions like Kefraya and Kerbet Qanafar pay their rent with 50% of their production. This situation will not encourage growers to invest in improved technologies to produce higher quality vegetables.

Although a large number of agricultural cooperatives (e.g. on joint buying and joint transport) are present in Lebanon (317 in 2009, Augier & Blanc, 2009) small farmers generally do not cooperate with respect to the selling of their products, but prefer to sell them directly to the wholesale markets. The position of small farmers in the value chain is therefore weak, also because of the low volume they produce.

Large growers sell their products to wholesalers and exporters and in some cases also directly to importers.

Especially for greenhouse growers it is a precondition to pay attention to the selling of their products, because they will have in most cases higher production costs. Investments in single tunnel (traditional type) amount to USD 6-7/m<sup>2</sup> and is USD 10.5/m<sup>2</sup> in adapted single tunnels. Investments in multi-tunnel greenhouses amount to USD 13-15/m<sup>2</sup> (without irrigation) and USD 20/m<sup>2</sup> including irrigation. With improved plant material (e.g. grafted seedlings) and improved cultivation systems (e.g. containers with peat/coir substrate or NFT system) growers can reach (much) higher yields and revenues in their greenhouses.

Another bottleneck of Lebanese agriculture is the agricultural population. The population is relatively old (89% of the farmers was older than 52 years in 2010) and most farmers are not educated or did not follow agricultural trainings (MoA, 2010). As a consequence, most farmers are not familiar with new methods and improved technologies and the theories behind them. Growers do not always apply the improved technologies in an appropriate way and the potentials are therefore not always being achieved.

Despite the lack of cooperation between and knowledge among Lebanese farmers, the Lebanese vegetable production sector is becoming more market oriented. Producers are lengthening the production season with new varieties and improved cultivation methods and are introducing post-harvest practices. This process is supported by input from suppliers of products and services.

Cold storage of harvested products at the farm and during transport to the wholesale market is still a main point of attention. Hardly any cold storages or cold rooms are used. In practice, harvested vegetable products go to the wholesale market as soon as possible, but heat damage during transport in open pickup trucks can result in soft fruit. Low quality products are packed in big crates, while better quality products are normally packed in small crates. Crates are provided by the wholesaler (MercyCorps, 2014).

## 4.3 Wholesale market and wholesalers

There are nine wholesale markets in Lebanon, two of which are smaller. Wholesale markets in the production regions such as Akkar and the Bekaa connect local supply with domestic outlets and export markets. These wholesale markets are also used as trade markets in off-season production periods and supply the regional market with mainly imported products.

Some smaller markets are mainly a market for household consumption such as Baalbeck in the Bekaa valley. Traders do not have strong links with the larger wholesale markets. Usually lower quality products are being traded with lower prices. Throwing away unsold products is a common practice.

The wholesale markets are open to all buyers, so the distribution of vegetable products is highly fragmented through different distribution channels. Distribution goes to small shops and restaurants, to hotels and local supermarket and to integrated supermarkets like Spinneys, Carrefour and Monoprix.

Greenhouse vegetables receive in general better prices than open field vegetables due to better quality. Some exporters and high quality traders prefer open field vegetables, because of their colour (deeper), better taste and consumer preference and they are willing to pay higher prices. Greenhouse vegetables mostly go to restaurants and hotels, because of their good external quality.

Data on wholesale prices became available as result of the ATP project, funded by the European Union.<sup>1</sup> All Chambers of Commerce in Lebanon collected daily price data of agricultural products. The ATP project has stopped recently and only the Chamber of Commerce in Zahle (Zahle and The Bekaa) is still collecting price data and is trying to convince other chambers of commerce to continue with collecting data. No distinction is made in registration of prices between products from open field or greenhouse crops (Info F. Fayad, Chamber of Commerce Zahle & The Bekaa).

Cold storage of vegetable products at the wholesale market is not common, although there are some 45 commercial cold storage providers available in Lebanon. Facilities are not suitable with respect to the capacity and quality of cooling (USAID, 2014).

Wholesale markets are in fact private businesses. The facilities are poor to moderate and the price setting is not transparent. Most of the trade is done on consignment and the commission fee for traders is 7-10% on the sales value. Although products are sorted and graded to some extent, there is no system of quality regulations at national level and at wholesale level. Most of the export products go the Gulf states without any quality requirements. It is to be expected that quality requirements will be introduced like just as they are required for export to the EU (e.g. GlobalGAP).

For an overview of the wholesale market Ferzol in Zahle, see Figure 4.2.



**Figure 4.2** Wholesale market Ferzol in Zahle: overview (left), fruit (middle) and vegetables (right)

<sup>1</sup> [https://europa.eu/european-union/about-eu/funding-grants\\_en](https://europa.eu/european-union/about-eu/funding-grants_en)



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## 4.4 Distributors

Distributors buy fresh products at wholesale markets and from importers and distribute these products to local retail, supermarkets, restaurants and hotels. The distribution mark-up (on producers prices) is 15-25% depending on market (CBI, 2016).

## 4.5 Packers/exporters

In Lebanon about 45 exporters operate in the fruit and vegetable value chain. Exporters mostly buy their products from the wholesale market, but also directly from large growers and/or dammans. A few large farmers also export the products themselves. As mentioned before, exports are mainly to the Gulf states and no quality regulations are yet required. There is a tendency towards quality products. When exporting to Europe the products have to meet the quality requirements (GlobalGAP and HACCP). This applies in particular for greenhouse products which can be considered as high quality products and are more and more meant for the high-end and export market.

There are about 8-10 large wholesalers/exporters, who have a strong position in the negotiations with the growers.

## 4.6 Processors

Processors play a role in the fresh vegetable chain, when products don't have the quality for export and/or retail market. For greenhouse vegetables their role is less important, because these fresh products are mostly sold unprocessed.

## 4.7 Retail

The domestic market has changed fast with an increasing number of retail outlets, like supermarkets and hypermarkets. Currently 10 domestic and international retail organisations are operating and the expectation is that this number will grow. Worth mentioning here are: Admic, Bou khalil, Carrefour (see Figure 4.3), Fahed Supermarket, goodies, Le Charcutier, Monoprix, O&C, Spinneys and TSC (The Sultan Center). Most retailers are located in Beirut and Tripoli, because about 50% of the population live there.



**Figure 4.3** Supermarket Carrefour in Beirut

A presentation of several vegetable products in supermarket Carrefour is shown in Figure 4.4. Products are presented in different sizes and packages with different prices.

Quality is not always premium as it is shown for strawberries in baskets (see Figure 4.5). This is a point of attention if producers will produce for the high-end market.



**Figure 4.4** Presented vegetable products in supermarket Carrefour (Beirut) in April 2017; lettuce (upper left), loose tomatoes (upper middle), sealed tomatoes (upper right), bell pepper (middle left), organic and imported vegetables (middle right), sealed strawberry (under left), cucumber (under middle), plates/baskets with strawberry (under right)



**Figure 4.5** Strawberry in baskets with soft spots (supermarket Carrefour, Beirut)

## 4.8 Other stakeholders

Besides the main actors within the value chain, also other organisations or companies play an important role in the functioning of the supply chain. CBI (2016) mentions two types of parties: supporters and influencers.

*Supporters* are parties that support the value chain in a commercial or institutional way and by (international) donors.

Examples of commercial parties are input suppliers and service providers. Input suppliers sell seeds and other plant material, chemicals and fertilisers, etc. Most inputs are sold on (short-term) credits, so input suppliers give short-term loans to the growers. The main reason for these loans is that growers receive the revenues during or at the end of the crop cycle.

The commercial banking sector is amply available in Lebanon, but lending to growers is limited. Problems are the high interests, high collateral requirements and lack of seasonal loans for agriculture (USAID, 2014). An alternative is the Central Bank's Kafalat loan guarantee programme, with a focus on lending to SME in the agricultural sector. With a good business plan and connections with the right people loans should be easily obtained. Despite the Kafalat alternative a lot of small and medium-sized growers are lending from wholesalers. Wholesalers give loans to the growers under the agreement that the growers sell their products to the wholesaler. The main reasons are that wholesalers do not have a formal system for lending money and if repayment by the grower is not (fully) possible – due to yield and harvest losses – the wholesaler will postpone the repayment of the debts to the next cultivation season. In this context, a greenhouse grower will have less chance of yield losses than an open field grower, because of his protected environment.

Institutional parties are farmer cooperatives, business support organisations, trade organisations and education & research.

Farmer cooperatives can support individual farmers in production, supply chain activities, cost reduction and/or in improving market access by providing knowledge and assistance in conducting joint activities. This will reduce the costs of individual farmers if they would do it themselves. Although 1,350 cooperatives are registered (Info MoA), only a limited number are functioning. Mostly cooperatives are active in organising training for growers on cultivation topics, than to develop marketing activities and to stimulate growers to be more market oriented.

The Federation of Chambers of Commerce, Industry and Agriculture – with four regional chambers – supports the value chain members and wherein agriculture and agro-processing are priority sectors. Support is given on export promotion, training and workshops on different themes (food safety,

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management skills, etc.), market information, laboratory services and technical assistance and extension service.

The Investment Development Authority of Lebanon (IDAL) is established by the national government as national investment and export promotion agency. Agriculture and agro-industry have been selected as sectors with the most promising opportunities. IDAL offers export promotion services (data on export markets, access to export markets, technical assistance and subsidising participation in foreign fairs), the AGRI PLUS programme (since 2011) for exporters and cooperatives working with fresh produce (streamlining production, packaging improvement, marketing and promotion and financial support of packaging costs). Next to this two specific financial services are being offered: a 20% additional subsidy to encourage exporters to improve quality of their products (required: internationally recognised certificate on quality and a certificate of the packinghouse) and compensation for the higher transportation costs as a consequence of the Syrian border closure.

Agricultural research, extension and education supports the value chain of fresh vegetable produce and is under the supervision of the Ministry of Agriculture. The Lebanese Agricultural Research Institute (LARI) conducts applied research. It has several experimental stations in different areas of the country helping to solve problems. LARI also conducts tests for export (soil, water) and gives free information about weather and technical issues. Extension service is a main function of the MoA, especially for small farmers, and has a big infrastructure and a good country coverage. Despite the large number of service centres, the majority of growers does not receive advice and the service is in practice weak. This weakness and related limited impact is a big obstacle in developing the agricultural sector. Possible reasons are the lack of human and financial resources, insufficient equipment at centres and lack of specialisation. Most advice on cultivation and post-harvest issues is given by input suppliers and in some cases also by donor programmes. With respect to education Lebanon has a reasonable public and private university level and public agricultural technical education system. Nevertheless education is facing some weaknesses, like lack of interest for the agricultural sector, insufficient budgets of MoA, insufficient capacities of teaching staff and poor curricula. These weaknesses do not meet the requirements of the sector and the (international) market demands (MoA, 2014) and are main points of attention.

*Influencers* are parties from the institutional environment, both nationally as well as internationally, which (can) have impact on the functioning of the value chain. First the national government has influence through its Ministries of Agriculture (MoA), Industry (MoI) and Economics and Trade (MoET). Due to the absence of a president for three years (till November 2016) various services were lacking for approved budgets and staff, like for IDAL. The MoA is the key actor in developing a legal and regulatory framework and improving infrastructure developments to promote investments and improve agricultural production and marketing. In 2009 the MoA Strategic Framework was formulated and updated in 2014/2015 for the years 2015-2019. The current main pillars are: issuance of appropriate regulations, improving organisational structure and role of the MoA, modernising the agricultural infrastructure and efficiency improvement of natural resources, improving agricultural extension, enforcing control on agricultural products, inputs, etc., developing value chains of agricultural products (improving quality, processing, marketing and export), establishing a credit scheme for small and medium-sized projects and conserving natural resources.

Trade policy is the responsibility of the MoET. Actually there is no national or sector export strategy. MoET however does offer trade statistics, tariffs and other trade information. A Lebanese Export Promotion Agency 'LEBEX' has recently been established and operates as a public-private partnership (CBI, 2016).

*International politics* also influences the functioning of the value chain. The Syria war has a huge impact on the agricultural sector. Border closure with Syria limits trade relations with Syria and other (Gulf) states through which normally transport of fresh vegetable products would take place. Another problem is the huge number of refugees from Palestinian and Syrian origin. These refugees live and work in Lebanon and disturb to some extent market conditions and already has caused food insecurity in some areas (FAO, 2015).

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## 5 Market trends

In this chapter trends are listed, with respect to vegetable products and greenhouse products in particular, for quality products meant for the high(er)-end domestic market and the export market. The domestic supply quantity of vegetables (=production + import - export) in Lebanon has increased in the period 2008-2013 (FAOSTAT, 2017). This quantity will probably increase further due to the increased number of refugees from the Syrian crisis.

### **Food security and food safety**

Lebanon is a net importer of fresh vegetable products. To ensure access to fresh vegetable products year-round supply is needed. In certain areas in Lebanon (coastal area, Mount Lebanon) greenhouse production is almost year-round possible. Improvement of technology and knowledge on different levels will enhance food production for all type of consumers.

Food safety is increasingly becoming an issue, especially when products are being exported to the EU and other developed countries. This tendency is also observed in the Gulf states, the main export destination for Lebanon. This includes requirements that have to be met on standards, like GlobalGap and HACCP. Also tracking and tracing are in that context becoming more and more important.

### **Sustainable production and products**

In Lebanon awareness is also growing that products and production processes become more sustainable and make less use of chemicals and natural resources, like energy and water. For example the availability of good quality water for vegetable production is under pressure, because of the increased need from other industrial sectors and the community (consumable water). To reach a higher level of sustainability, improved seed, new methods and/or innovative technologies should be implemented depending on the local conditions (e.g. climate) in order to increase the input efficiencies.

### **Niches**

The market of niche or quality products is growing. Niche products give an added value to the consumer and they are willing to pay (more). Niche products can have a better taste, special colour, shapes, nutritional value or more convenience (easy to peel, seedless, etc.). The niche market (including organic products) is still of limited dimension in Lebanon, but is increasing strongly in developed countries like the EU and offers possibilities for export.

### **Chain organisation**

To react and anticipate on domestic and international market developments a professionalisation of the supply chain will be needed in order to compete with other importing and exporting countries. A first point is standardisation and legislation along the chain. This will be a minimum condition for quality products, especially for the export market (e.g. Europe).

Another main issue is to provide adequate information about new cultivation methods, post-harvest issues and market information to the actors in the chain in order to maintain or improve product quality through the chain. Better market information enables growers also to be on the domestic and/or export market when there are less national and international competitors.

The purchasing power of supermarkets in Lebanon but also on the export market is increasing continuously and will result in higher requirements concerning food safety and sustainability. This will put pressure on the way of producing by Lebanon growers and the organisation of the supply chain.

### **Developments on other markets (including geopolitical tensions)**

The European market for fruits and vegetables (especially commodities) is stable, but the market in the Gulf States and Africa is expanding. There is also an increasing interest in high quality products for

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the high-end market. The Eastern European market is also expanding. The demand for quality fruits and vegetables is still limited, but this will grow, although consumers in Eastern Europe are price conscious.

Lebanese neighbouring countries are expanding their production area and production capacity as well and Lebanon will face more competition from Syria, Jordan, Turkey, Egypt and other Mediterranean countries on the domestic and on the main export market (Gulf region).

The Russian ban since 2014 on fruit and vegetable export from Europe to the Russian market has put pressure on the EU internal market and European countries are looking for other destinations for their fruit and vegetable products. This includes that Lebanese export is facing more competition on international markets, not only for commodities but also for quality products. On the other hand export to the Russian market would be interesting for Lebanese vegetable products, but the long distance to Moscow is an serious obstacle.

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## 6 Bottlenecks

At this moment some factors are preventing Lebanese growers to fully profit from the market trends in the previous chapter. A few large-scale growers are already capable to meet the requirements from domestic and export markets on quality, safety, environment and social level. Special attention is paid to vegetable products from greenhouses.

### *Lack of knowledge*

There is a lack of technical knowledge among growers how to use improved technologies in a proper way. Moreover, Lebanese farmers are hardly educated and do not follow agricultural trainings. As a consequence the potentials of a new technology, like improved seed and other (soiless) growing media, will not be realised and as a consequence improvement of production and quality will stay out of order. Greenhouse production systems offer more perspectives than outdoor cultivation to control and manage the growing environment of the crop, but it requires more knowledge to operate it.

Quality control during pre and post-harvest phase is limited, so fresh products are very vulnerable. The concept of the cold chain is hardly known and implemented, so optimal conditions for harvesting, storage and transport of vegetable products are hardly present with high levels of post-harvest losses as consequence. This hinders the production and delivery of quality products to the market. Another obstacle is the presentation of products by producers. Products are mostly presented in standard packages. More variation in presentation, like various packages for different consumer segments, will make products more attractive. Anticipating on needs and wishes of retailers is undeveloped. This point is especially relevant for high quality products.

Although the Lebanese Ministry of Agriculture is supporting the vegetable sector by means of research, extension service and education, the related impact is limited. The quality of extension service and education is poor (see 4.8). As a consequence, information about new methods and technologies do not reach practice and development of the vegetable sector is going (too) slowly.

### *Small scale (greenhouse) farms*

Most growers have small-scale (greenhouse) farms, older or old equipment and use traditional methods to cultivate. Growers use local varieties, which do not always meet high-end market demands.

In large scale farms new technologies are earlier feasible, can meet the requirement on sustainability and safety and will be more cost-effective. Small scale farms could also profit from this cost-effectiveness, like selling inputs, by collaboration with other growers.

### *Access to market*

Growers have limited access to the high-end domestic and the international market, because other chain actors like middleman, wholesalers and/or exporters have a stronger position in the negotiations. This includes that most growers will not always get a fair price for their products. Only a limited number of large growers have a better position. In some cases these growers are selling directly to the retailer or exporter.

Despite the number of cooperatives, there is no culture to cooperate and cooperatives are not effective in collective sales and marketing.

Not all growers are capable of meeting the requirements of the domestic and international buyers, like Global Gap. Thus, here sales channels are out of reach for these growers and as a consequence these growers do not receive higher selling prices. Small farmers are in that perspective very dependent on the efforts of the middleman. The domestic market structure is weak. In most cases many actors are involved (long chain) and price setting is not transparent. The farmers are the weakest actor of the value chain.

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Lebanon has more or less the same production calendar as some other Middle East countries and European Mediterranean countries, which results in strong competition on the domestic and international market (Europe and the Gulf States).

Another factor is the closure of the Syrian border for transports of vegetables to Syria itself or other Gulf countries (GCC). Consequence is that products have a longer route, by truck, boat or plane, to the final destination and result in higher costs and extra transport time.

Last but not least is the lack of good quality export data of fresh vegetables from Lebanon to the export countries and data of other fresh vegetables exporting countries to the same destination countries. This situation hinders the Lebanese greenhouse sector to anticipate and react on market developments.

#### *Access to finance*

(Small) farmers have little access to financial means. Banks do not loan money easily to farmers and put many restrictions, like collateral and a business plan, and charge high interest rates (>15% on an annual base). In some cases farmers cannot pay back the loan due to low production (e.g. diseases) and/or low prices.

One programme (IRDP with Kafelat, since 2010; Leeters, 2016) is running to help those growers to lend money through revolving funds (micro credits). The programme organisation helps farmers with getting the finance, making plans and execute it. Only one bank is involved with a special interest (debit/credit of 5%-7%).

The Ministry of Agriculture has some subsidy programmes for the agricultural sector, but the budgets are limited and for the short term and the impact is low. For farmers who want to invest in greenhouse production it is therefore very difficult to obtain credits. For inputs like seed, fertilisers and crop protection input suppliers are willing to lend money to farmers for the short term.

#### *Government support and other organisations*

Although the Lebanese government stimulates the agricultural sector, support is insufficient and the capacity and budgets are limited to improve and strengthen agricultural production and trade. Moreover public-private connections are weak, especially between the private sector and research, extension service and education. The lack of an adequate and qualified research and education system does not boot the vegetable sector.

The absence of a land-renting law means that land can only be rented for one year or one season. For farmers an unsecure situation, on which they cannot develop a strategic plan.

According to different actors and influencers in the value chain Lebanon does not have a strong agricultural policy. The agricultural sector is lacking of up-to-date market and structure information (last Agricultural census is from 2010). This prevents making, executing and monitoring plans for the short and long term. As a consequence the impact is low in improving the agricultural sector.

Although different international donors (USA, France, Italy) has started projects trying to improve the agricultural sector, still the impact is low according to different stakeholders. The projects did not strengthen the agricultural sector as it was intended and expected.



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# 7 Opportunities

The following opportunities can be identified:

## *Development and transfer of knowledge*

- Improvement of the agricultural knowledge and information system (AKIS) consisting of education, research and extension service. Enhance education on different levels (vocational, college and university) and try to make strong linkages between actual practices and needed skills and competences to be learned. Develop capacity and quality of (scientific) staff, curricula and modernise facilities;
- Improvement of infrastructure of research institutes, by modernizing facilities (e.g. laboratories, experimental stations) and develop staff capacities;
- Improvement of extension service by developing qualified consultants and trying to link extension service to both practice as well as to research and education;
- To achieve this more budget has to be reserved by the government (MoA) to increase the knowledge level among all actors in the supply chain. Developments on technological fields should go hand in hand with development of (required) knowledge;
- Strengthening of agricultural knowledge is of joint interest for the private and public sector and should be supported by public-private partnerships. Focus should be placed on improved and proven technologies and management methods via a step by step strategy, which can be adopted more easily by different actors in the value chain (suppliers, producers, traders and distributors).

## *Markets*

- Vegetables products from greenhouses have good opportunities when focussing on high-end markets in Lebanon and the export markets (Gulf States, Africa and Europe). Greenhouse farms which can meet the requirements on food safety and sustainability of the EU have the best prospects, also on the other export markets. Competition on low cost strategy will not be very successful, because of the low volume and discontinuous supply.
- Best opportunities for greenhouse vegetables products are products for the high-end and niche market, like cherry tomato, small cucumber, coloured pepper, strawberry, iceberg and organic products in different presentations for different consumer segments;
- Opportunities are also present when producing and supplying commodities and quality products during off-season in other competing countries;
- Cooperation of producers on the field of sales and marketing can strengthen their market position in the value chain, but requires a mental shift in attitude towards cooperation. Moreover shortening and/or re-organizing the value chain through direct supply from producers to wholesale and subsequently retail can also offer perspectives by excluding middlemen and dammans. The government can support this development through adapted or specific policies and incentives, such as subsidy structures, low rent on credits, etc..

## *Finance*

- Development of programmes, with which growers can be supported in shifting from outdoor to greenhouse production or from low-tech greenhouse to mid-tech greenhouse production. Produce of high quality products is the objective. Financial support can be given as subsidy or revolving funds. Starting point of such a subsidy system or financing instrument should be stimulating sustainability, market development and competitiveness instead of stimulating production.
- Develop and finance programmes with which producers can be educated on sales and marketing of high quality products. In particular for cooperatives of producers.
- Greenhouse farmers can obtain finance for inputs from input suppliers. These suppliers provide the farmers with improved seed, fertilisers, etc. aiming at quality products. These supplier will be paid by the revenues of the producers. This option is worthwhile when producers are organised in producers groups and can develop a better negotiation position.

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# 8 Conclusions and recommendations

## 8.1 Conclusions

The production of greenhouse vegetables is of limited quantity and the cold chain concept is not common practice among growers, wholesalers and distributors in order to deliver the quality and volume for the high-end market. Hardly any production is Global Gap certified. Also organic production methods are hardly used, because of the lack of knowledge among greenhouse growers.

The value chain of vegetables and fruits is dominated by middlemen who sell the products on behalf of the small and medium-sized producers. These producers are more or less dependent on the middlemen about the price they receive. Because of this situation producers have a weak position and there is little incentive to modernise their greenhouse farms. Market information (wholesale prices) is scarce and no prices of greenhouse products are collected.

No system of quality regulations is currently operational at national level and at wholesale level. Most export products go to the Gulf region without any quality requirements, but this will probably change. For export to Europe some requirements have to be met, like Global GAP. Only a few Lebanese producers and exporters can fulfil these requirements.

The following market trends are identified: food security and food safety, sustainable production and products, niche products, professionalisation of the chain organisation and development on other markets. Although these trends have a general character, they are not well addressed in Lebanon both on governmental as well as on private side to take action on that.

The Lebanese greenhouse sector is facing several bottlenecks: lack of knowledge among growers, traders and distributors (e.g. cold chain concept), most producers have small scale greenhouses and use traditional cultivation methods and local varieties (do not respond to consumers preferences), limited access to high-end market (weak position of producers and no collaboration between producers on sales), limited access to finance (banks have many restrictions and charge high interest to producers and wholesalers) and poor support from the government (no strong agricultural policy, capacity and budgets are limited and weak public-private connections).

## 8.2 Recommendations

With respect to greenhouse vegetables, the following recommendations can be made to improve the competitiveness of the greenhouse vegetable value chain:

- Professionalise the value chain: improvement of the organisation of the value chain from producer to exporter by creating an environment with better access to technology, knowledge and finance. This will improve the cold chain structure in all links of the value chain, like cold storage and new packing materials or methods. This can also make the market structure more transparent and reduces the role of the middlemen.
- Stimulate collaboration between (small and medium-sized) producers in order to establish joined forces and to reach larger volumes of (quality) products in order to be a more interesting supplier of quality products for traders and exporters.
- Improve the agricultural knowledge and information system: enhance and support the level of education, research and extension service and their mutual interactions for all stages in the value chain (from producer to exporter).
- Strengthen the linkages between public and private sector in order to reach a common strategy on developing and supporting the (greenhouse) vegetable sector. Enhance the connections between education, research and extension service on the one hand and practice on the other hand.

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- The Lebanese greenhouse vegetable sector should focus on the high-end domestic and international market by supplying added value with high quality, niche and /or organic products, like cherry tomato, mini cucumbers, iceberg, coloured peppers, etc. This requires that the minimum level of quality requirements will be achieved (Global GAP, HACCP, etc.).
  - Another opportunity is to produce and provide the international market with high quality products in off-season period of competing countries.
  - With respect to public and private financing instruments (subsidy, revolving funds, loans) one of the criteria should be enhancing sustainability, market development and competitiveness of the value chain.

### 8.3 Relation to Adaptive greenhouse concept

Based on conclusions and recommendations the following topics will be addressed to in the adaptive greenhouse approach (mentioned as component 5 of the project 'Strengthening the Lebanese Water and Agricultural Sector'):

- In extension of the project cooperation between farmers will be emphasised;
- If farmers want to obtain higher prices they have to change to niche markets and export markets and must deliver a better quality according to Global Gap. If not produce comes on the local market where competition with low quality produce are already high;
- This analysis will be used to come to an economic analysis of the suggested investments/improvements in this project (return on investment);
- The project will try to connect farmers to the project and to introduce the Dutch phenomenon 'study groups' to learn together from the project.
- In the project new or adapted greenhouses and soilless cultures will be introduced. Farmers will get the chance to participate in trainings to improve knowledge and to decrease the knowledge gap to new developments.

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### Websites

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[www.fao.org](http://www.fao.org)

# Appendix 1 List of interviewed persons en visits

Name	Organisation/company	Location	Position
Mr. Marc Zeeny	Dutch Embassy	Beirut	
Ms. Roula El Khoury	Robinsonagri	Mastita	Chief Financial Officer
Ms. Lina Zgeib			Business Development Manager
Mr. Johny Aoun			Greenhouse and Production Line Officer
Mr. Fady Abou Fayad	Chamber of Commerce Industry & Agriculture of Zahle & The Bekaa	Zahle	Head agricultural extension service
Mr. Fadi Sarkis and two colleges	NATAGRI	Chtaura	Chief Executing Officer
Mr. Nassar Lama	DAI	Beirut	Technical Director Agro Food Industry
Mr. Winfried Pietersen	PietersenConsult	Beirut	Quartermarker project 'Strengthening Lebanese Water and Agriculture Sector'
<b>Visits</b>			
Ferzol	Wholesale market	Zahle	
Carrefour	Supermarket	Beirut	
Grocery	Local market	Beirut	

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