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February 2018

Avocado Value Chain “Economic Impact Analysis”

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This publication was produced for review by the United States Agency for International Development.

It was prepared by DAI.

Lebanon Industry Value Chain Development - LIVCD Project

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List of Abbreviations

AVC	Avocado Value Chain
CCIAB	Chamber of Commerce Industry and Agriculture in Beirut
CDR	Council for Reconstruction and Development
DAI	Development Alternatives Inc.
DEI	Direct Economic Impact
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HORECA	Hotels Restaurants and Catering
IDAL	Investment Development Authority of Lebanon
IRI	Industrial Research Institute
IDE	Indirect Economic Impact
IEI	Induced Economic Impact
LARI	Lebanese Agriculture Research Institute
LIVCD	Lebanon Industry Value Chain Development
LRA	Litani River Authority
MENA	Middle East and North Africa
MEL	Monitoring, Evaluation and Learning
MOA	Ministry of Agriculture
MOEW	Ministry of Energy and Water
NGOs	Non-Governmental Organizations
TEI	Total Economic Impact
USAID	United States Agency for International Development
VC	Value Chain

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Executive Summary

This report assesses the economic impact of the Lebanon Industry Value Chain Development project (LIVCD) on Lebanese avocado production covering the period 2014-17. The LIVCD project provided technical assistance to the avocado value chain actors and facilitated their access to finance with the aim of improving the overall competitiveness of the value chain. It is a quantitative study tracking the changes in the economic performance of the avocado value chain documenting their nature, context and extent through evaluation of a set of indicators including the increase in farm level production, the value of sales in both local and export markets, gross margin, income and investments. The study compares the status of the avocado value chain before and after LIVCD intervention to estimate the

- Direct Economic Impact at farm level
- Indirect Economic Impact for the wider value chain looking at stakeholders' forward and backward linkages
- Induced Economic Impact related to leveraged private sector investments.

A cost-benefit ratio is calculated for each level to assess the efficiency of LIVCD investments looking at the

- **Direct impact:** the direct technical support provided by the LIVCD project targeting around 600 farmers which has resulted in the improvement of the quality and quantity of avocado production. This is reflected in a positive direct economic impact ratio estimated at \$2.65 for each \$1 invested by the LIVCD project.
- **Indirect impact:** all avocado value chain actors have benefitted indirectly from the linkages created by the project to increase their incomes and grow their businesses. This is demonstrated in the indirect economic impact ratio estimated to be \$7.84 for each \$1 invested by the project.
- **Induced impact:** the project has stimulated 44 farmers to invest in avocado production resulting in an induced economic impact ratio of \$7.25 for each \$1 invested.

From 2014-17, the total value of the avocado value chain increased from \$19.2 million to \$26.1 million, even though the farm gate price remained at about \$2.4/kg. Adding together the three economic impact levels, direct, indirect and induced, this resulted in a total ratio of 17.74, i.e. for each \$1 invested in this value chain an additional \$17.74 was generated. Based on the production and consumption trends estimated for the period 2014-17, the value Lebanese avocado sector is projected to reach \$34 million by 2020- a thirty per cent increase. When observing the current status of the avocado VC and comparing it to pre project support it is noted that LIVCD interventions contributed positively to both the scale-up in the overall development of the value chain as represented by the following factors:

- significant private sector investment attracted by the high profitability of avocado
- an increasing number of larger and professional farmers who can make a difference in terms of production quality and quantity and further scale up of the value chain
- conversion of non-profitable citrus plantations to avocado plantations
- transfer of technical know-how and good agricultural practices to all avocado producers

I. Background and Methodology

Despite the challenges and obstacles hindering the development of the Lebanese agriculture, the sector still plays an important role on the socio-economic and environmental levels. Many Lebanese agricultural and agro-processed products have the potential to provide economic opportunities, contribute to rural development, and compete on the regional and international markets. However, most of Lebanon's agricultural Value Chains (VC) are facing an array of institutional, technical, environmental, economic and financial constraints, resulting in their low competitiveness. These VC need to be upgraded and well-structured, which will improve the quality and specifications of the Lebanese agricultural products and give them the ability to meet local and international market demand and requirements.

Within this context, the Lebanon Industry Value Chain Development (LIVCD), a 6 year and four months long project launched in 2012 and funded by the United States Agency for International Development (USAID) with \$46.2 million budget, aimed at supporting Lebanon's economic stability and providing income-generating opportunities in rural areas through improving the competitiveness of agricultural products by increasing their quality, quantity, and consistency.

The LIVCD project identified seven rural value chains for project intervention, including: Olive Oil; Grapes; Pome fruits: Apples and Pears; Stone fruits: Cherries and Avocados; Processed Foods; Rural Basket which includes honey, thyme, and free range eggs; and Rural Tourism. LIVCD interventions in the Avocado VC consisted mainly of:

- Providing technical assistance to disseminate and scale up innovative agricultural practices and technologies and build capacities through customized training programs for farmers and other value chain operators including nurseries.
- Facilitating access to markets, financing opportunities, and investments by the private sector.

Through these two main interventions in the Avocado VC, LIVCD aimed at:

- Improving the quality and diversifying the offer to increase the production value.
- Increasing the production volume with consistent supply for the local and export markets.

Measuring the economic impact of agricultural development projects targeting specific VC is important to demonstrate the effectiveness and efficiency of this approach. The underlying purpose of this report is to analyze the economic impact of LIVCD intervention in the Avocado VC and the resulting changes. It documents the nature, context and extent of the economic impacts realized by estimating:

- The increase in production quality and quantity.
- Production value.
- Sales on the local and export market.
- Profit margins and income for the VC.
- Investments by the private sector.

The study offers also insights for future trends and opportunities.

The economic impact assessment covers the period (2013-2017) of the LIVCD intervention in the Lebanese avocado VC. It is a quantitative study that tracks the changes in the economic performance of the value chain. It compares the before and after LIVCD situation (pre-intervention and post-intervention), and uses selected indicators to estimate the economic impact on three levels (**Table. I**):

- Direct Economic Impact (DEI) on the farm level (reduced cost and increased income).
- Indirect Economic Impact (IDEI) for the wider value chain with stakeholders' forward and backward linkages (from inputs to output) with the determination of the value-added, profit margins, and total economic value of the Avocado Value Chain.
- Induced Economic Impact (IEI): leveraged private sector investments, mainly through loans.

Table. I. Economic impact indicators for the Avocado value chain

Level	Impact	Indicator	Source of Information
Farm	DEI	Cost of production per 1 ha of Avocado	LIVCD team VC experts Farmers Nurseries
		Productivity volume per 1 ha of Avocado	
		Farm gate price of Avocado	
		Cost/benefit analysis for 1 ha of Avocado	
		Income generated by grafting services	
		New cultivated areas and areas converted to Avocado	
Value Chain	IDEI	Evolution of Avocado cultivated area	Wholesale market
		Income generated by land preparation	Retail shops
		Input suppliers sales (irrigation, fertilizers, and pesticides)	Banks
		Nurseries production and sales in general	Kafalat loans
		Export volume and value with profit margins	Existing studies
	Local market sales with wholesale and retail profit margins		
	IEI	Type and value of private sector investments	

A cost-benefit ratio is calculated for each level to assess the efficiency of LIVCD investments:

$$\text{Ratio} = \text{Economic impact value} \div \text{Allocated budget}$$

When the ratio is higher than 1, this means that the investment is efficient and rewarding.

The following approach and tools were used to conduct the economic impact assessment and to meet the key objective of the study:

1. Review of secondary data including the LIVCD baseline study and progress reports to present a general overview of the AVC structure in Lebanon.
2. Field visits to selected farms and partners supported by LIVCD.
3. Interviews with key informants and stakeholders of the AVC and collections of economic data and indicators.
4. Update the AVC structure and compare the before and after project situation.
5. Computation of the DEI, IDEI, IEI, and Total Economic Impact TEI.

II. Economic Impact Assessment

The economic and social importance of Avocado demonstrated in the baseline assessment of the LIVCD project conducted in 2014 and in the previous sections of this report justify the need to carry out a post-project Economic Impact Assessment and to evaluate the changes affecting the economic performance of the VC and the positive impacts on its different stakeholders.

II.1. LIVCD support to the Avocado Value Chain

LIVCD intervention in the Avocado VC focused on three main axes:

AXIS 1: Increase quantity and quality of Avocado production in Lebanon

- Leverage Private Sector Investment through providing investors with advice on suitability, marketability and profitability of their intended avocado investment.
- Promote improved production practices including orchard establishment, seedling selection, grafting and pruning, irrigation, harvesting, and post-harvest.

AXIS 2: Increase market share in export markets

- Support exporters with actionable market intelligence.
- Create linkages and information channels between LIVCD-supported producers, aggregators and exporters.
- Determine appropriate varieties for the selected target markets.

AXIS 3: Increase Avocado processing in Lebanon

- Develop vertical linkages to connect growers with millers.
- Leverage Private Sector Investment.

LIVCD allocated \$857,295 for the Avocado VC among which \$494,317 dedicated to direct technical support and project management cost, and \$362,978 in the form of grants implemented between 2014 and 2017. The contribution of the grants beneficiaries was \$332,630, making the total amount invested in the Avocado VC \$1,198,925. (Figure.1)

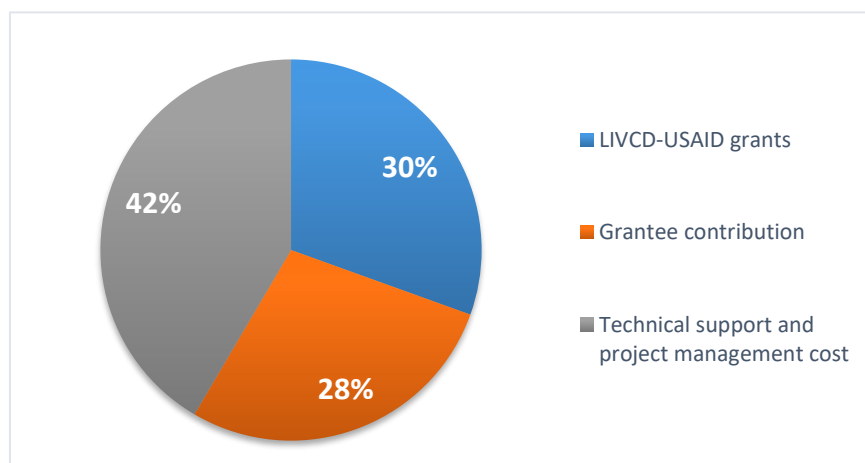


Figure.1. Distribution of investments in the Avocado VC between 2014 and 2017

The eight grants were awarded to four beneficiaries (**Annex.1**):

- **Hariri Foundation in South Lebanon (2 grants for a total value of \$210,763)** targeting around 150 farmers through the provision of technical support and training program; establishment of Avocado Demonstration plot; upgrading the Hariri Foundation Subtropical Fruit Tree Nursery to increase its productivity; training of trainers agricultural engineers to build their capacity to provide technical support to farmers; and build the avocado directory and organization of avocado stakeholders.
- **Agricultural Cooperative Association of Menjez in Akkar (2 grants for a total value of \$160,448)** targeting around 100 farmers through the introduction of Avocado orchards to Akkar region and technical support and linkages to the VC operators.
- **Agricultural Cooperative of Bater in the Shouf (2 grants for a total value of \$153,800)** targeting 100 farmers through the establishment of a demonstration plot to share good agricultural practices and provide ongoing support for avocado farmers; upgrading orchards by installing drip irrigation systems for 15 small avocado farmers from Bater and neighboring villages; and technical support for 85 farmers; and upgrading the services provided by the cooperative through purchasing of trimmers, shredders and sprayers.
- **Emkan Emkan for Microcredit and Sustainable Social Development in Akkar (2 grants for a total value of \$170,597)** targeting 100 farmers through supporting them to establish Avocado orchards and providing technical support.

The following table summarizes the number and characteristic of beneficiaries who benefited from one or many activities provided through the LIVCD Avocado intervention. (**Table.2**)

Table.2. Number and characteristics of the LIVCD Avocado intervention

Category	Number	Characteristics	Services provided by LIVCD
Existing Avocado Farmers	594 (16% of the total number of farmers)	80% small farmers (<1 ha) 19% medium farmers (1 to 10 ha) 1% large farmers (>10 ha) Total cultivated are: 556 ha (90% of the total cultivated area in 2014) 95.5% males and 4.5% females South Lebanon 40% Mount Lebanon 28 % North Lebanon 14% Akkar 11% Nabatiyeh 7%	Conferences, training, and field visits to pilot plots Linkage to VC operators (input suppliers, nurseries, and market) Technical support to upgrade existing orchards and establish new ones
Farmers and other persons supported to establish Avocado orchards	426	36 % no land 31% small farmers (<1 ha) 27% medium farmers (1 to 10 ha) 6% large farmers (>10 ha) 91% males and 9% females South Lebanon 38% Mount Lebanon 22% North Lebanon 8% Akkar 23% Nabatiyeh 9%	Facilitate access to loans Promotion and marketing
Grafting specialist	16	All men 2 of whom previously provided this service before the LIVCD intervention	Field training Linkage to farmers
Nurseries	14	13 old and 1 newly established	Technical support Facilitate access to finance Nursery upgrading
Input suppliers	13	Mainly located in south Lebanon	Conferences, training, and field visits to pilot plots Linkage with farmers and cooperatives

Market operators	4	Two exporters, 1 wholesaler, 1 retailer	Linkage with farmers and export market
Financial institutions	3	1 commercial bank, Kafalat, and 1 micro-credit institution	Linkage with farmers
Processing units	2		Introduction of Avocado processing techniques and processing tests
Universities	1	Lebanese University	Lectures/field visits to pilot plots

II.2. Direct impact

The direct changes in the Avocado VC economic performance are related to the grants, the technical support for farmers, and the facilitation of access to loans. They are presented in **Table.3** using a selection of indicators comparing the pre and post project situation.

Table.3. Estimation of the direct economic impact

Beneficiary/ stakeholder	Indicator	Before LIVCD intervention	After LIVCD intervention	Economic impact Before/After intervention difference
Hariri Foundation Subtropical Fruit Tree Nursery	Number and value of seedlings produced	1,500 seedlings 12,000\$	20,000 seedlings 160,000 \$	+148,000 \$ considering the period 2015-2017
594 existing Avocado farmers cultivating 556 ha	Increased income	Production cost 6,666 \$/ha	6,000 \$/ha	+ 2,778,888 \$ considering the period 2016-2017
		Productivity 12.9 T/ha	14 T/ha	
		Revenue 21,500 \$/ha	23,333 \$/ha	
		Income 14,834 \$/ha	17,333 \$/ha	
69 new Avocado farmers supported by LIVCD grants	Additional income	None	Not available because Avocado orchards become productive 3 years from time of plantation	N/A
Grafting specialist	Number and income per year	2 specialists 15,000 \$	16 specialists 140,000 \$	+250,000 \$ considering the period 2016-2017
Total direct economic impact for the period 2015-2017				3,176,888 \$

The DEI ratio is $3,176,888 \div 1,198,925 = 2.65$

For every \$1 invested by LIVCD, \$2.65 were generated in a direct way by the private sector and farmers between 2014 and 2017.

II.3. Indirect impact

Indirect Economic Impact is estimated for the wider value chain with the stakeholders' forward and backward linkages (from inputs to output). It determines the total value-added for the Avocado VC taking into consideration the changes in physical and financial flows in the Avocado VC determining the increase in its total economic value.

Data used for the indirect impact assessment are collected from secondary reports and field observations and estimations validated by the LIVCD team. It uses 2014 as a comparison baseline with the year 2017. The indicators used to elaborate a new structure for Avocado value chain are presented in **Table.4**.

Table.4. Estimation of the indirect economic impact for service providers

Indicator	Before LIVCD intervention (2014)	After LIVCD intervention (2017)	Economic impact Before/After intervention difference
Evolution of Avocado cultivated area	615 ha	834 ha	219 ha
Total productivity based on 12.9T/ha in 2014 and 14 T/ha in 2017	7,936 T	10,842 T	2,906 T
Income generated by land preparation and labor	1.2 Million \$	2.5 Million \$	1.3 Million \$
Input suppliers sales (irrigation, fertilizers, and pesticides)	2 Million \$	2.6 Million \$	0.6 Million \$
Nurseries production and sales in general	0.3 Million \$	0.9 Million \$	0.6 Million \$
Total increase in input generated by service providers			2.5 Million \$

Assuming that the farmers profile did not change and that the prices and margins remained almost the same in 2017 the total economic value of the Avocado VC is estimated at \$26.1 million, compared to \$19.2 million in 2014, registering a \$6.9 million increase. (**Figure.2**)

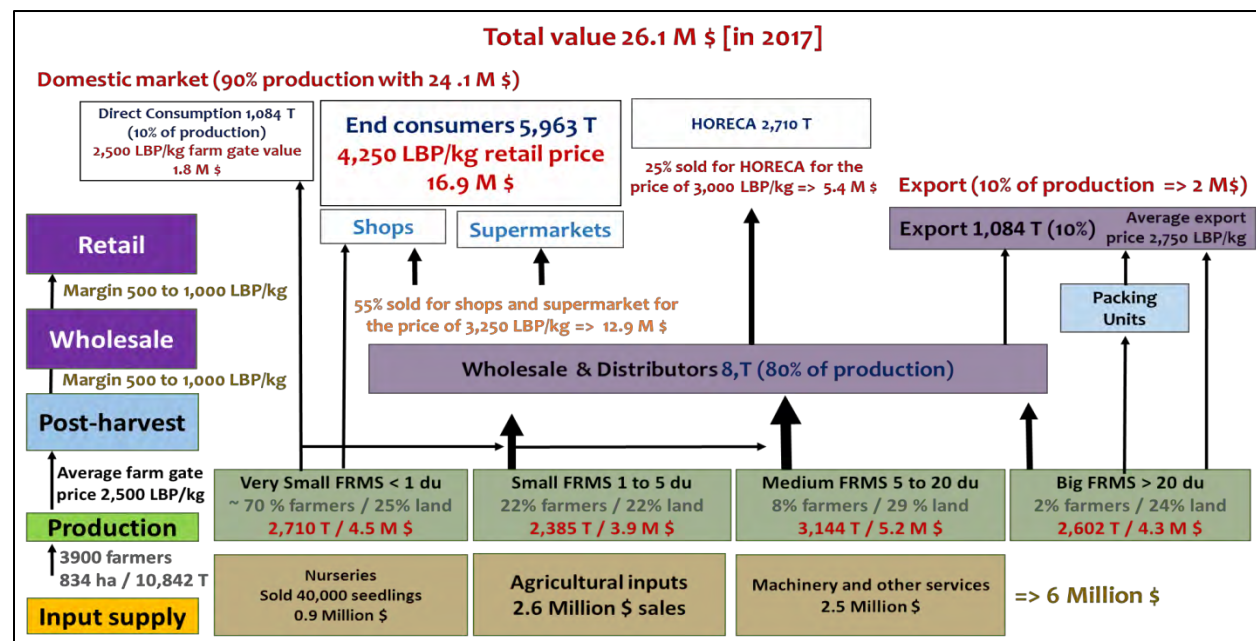


Figure.2. Structure of the Avocado Value Chain in 2017

The input suppliers and services providers' income increased by \$2.5 million between 2014 and 2017. When is added to Avocado VC value increase, the total IDEI reaches \$9.4 million making the IDEI ratio $9,400,000 \div 1,198,925 = 7.84$

Consequently, **for every \$1 invested by LIVCD between 2014 and 2017, \$7.84 were additionally added to the Avocado VC in 2017.**

Based on the 2014-2017 comparison and with the same production and consumption trends, we can estimate a 30% increase in the Avocado VC value by the end of 2020 to reach around \$34 million in addition to the same growth in the input and services provision market reaching a total value of around \$7.8 million.

II.4. Induced impact

Induced Economic Impact is calculated for leveraged private sector investments through private equity and loans. During the LIVCD intervention period (2014-2017), the Avocado VC team identified 17 new investments using private equity for the value of \$3,850,763 and 27 investments through Kafalat loans for the value of \$4,841,599 (assisted by LIVCD to present their business plans). The 44 investments consisted of the establishment of 42 new orchards (in addition to the 69 orchards established through the grants), a new specialized nursery, and a company "Lebanese Avocado" specialized in technical support and orchard management. The total value of these induced investments is \$8,692,363.

The IEI ratio is $8,692,363 \div 1,198,925 = 7.25$

For every \$1 invested by LIVCD, \$7.25 were invested by the private sector.

II.5. Total economic impact

The TEI ratio is the sum of the direct, indirect, and induced ratios, it is accounts for:
 $DEI (2.65) + IDEI (7.84) + IEI (7.25) = 17.74$

Taking into consideration a two-years period (2015-2017)

- It is normal to have a low DEI ratio (2.65) since the newly planted Avocado orchards directly supported by the project will reach their production maturity starting 2019.
- The IDEI and IEI are relatively high, they show a significant change and scale-up of the Avocado VC and an important interest for private investors to enter this market.

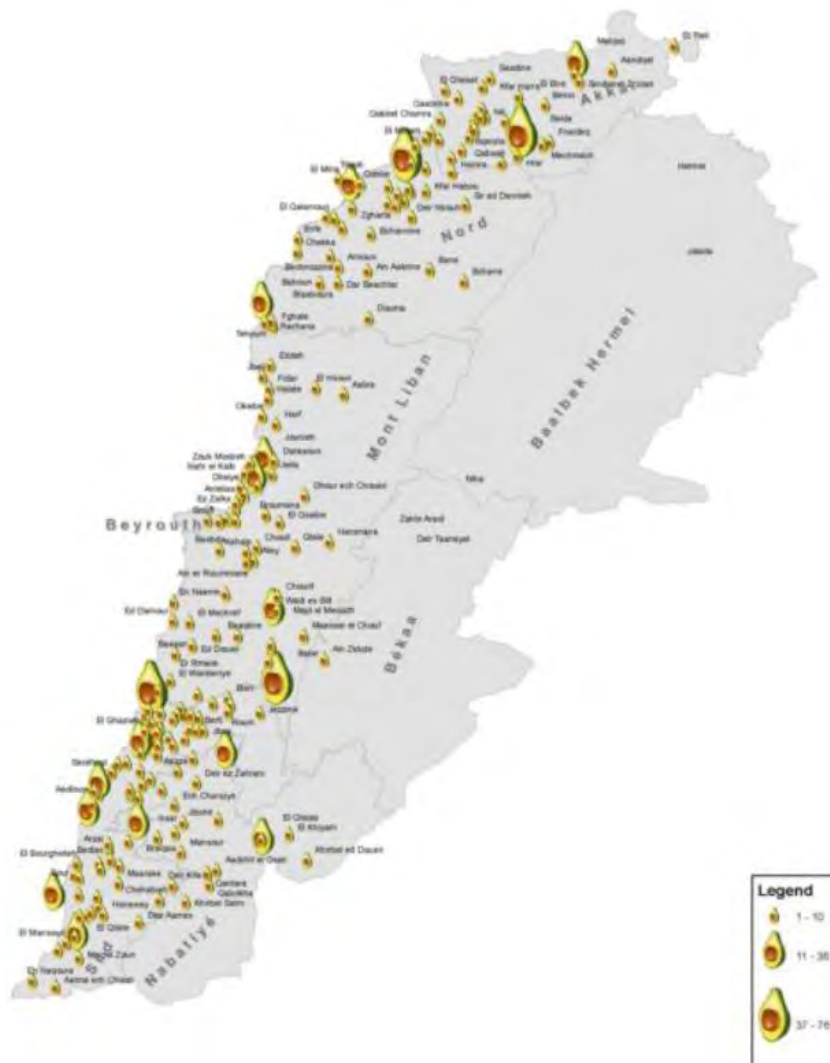
In total, for every \$1 invested by LIVCD in the Avocado VC, \$17.74 were generated between 2014 and 2017.

III. The Avocado Value Chain in Lebanon

This section presents the characteristics of the Avocado VC in Lebanon before the LIVCD intervention based on the initial VC assessment conducted in 2014.

III.1. Avocado production

Avocado production in Lebanon is spread along the coastal strip, on the western slopes of Mount Lebanon on altitudes reaching 700 m above sea level, in Akkar plain, and in Nabatiyeh and Marjayoun area. The highest concentration of Avocado orchards is situated on the southern coast between Saida and Tyr. (**Map.1**)



Map.1. Geographical distribution of Avocado orchards in Lebanon
(Source: LIVCD)

Based on anecdotal information given by farmers interviewed for the initial Avocado VC assessment conducted by the LIVCD team in 2014, avocado production was introduced to Lebanon in the late 1960s¹. In the 1980s and 1990s, some larger landowners began to import seedlings from California² and to invest in the commercial potential they saw in avocados.

The following figures present the evolution of Avocado production in Lebanon in terms of cultivated area, volume, and value for the last 15 years according to FAO statistics. (**Figure.3 and Figure.4**)

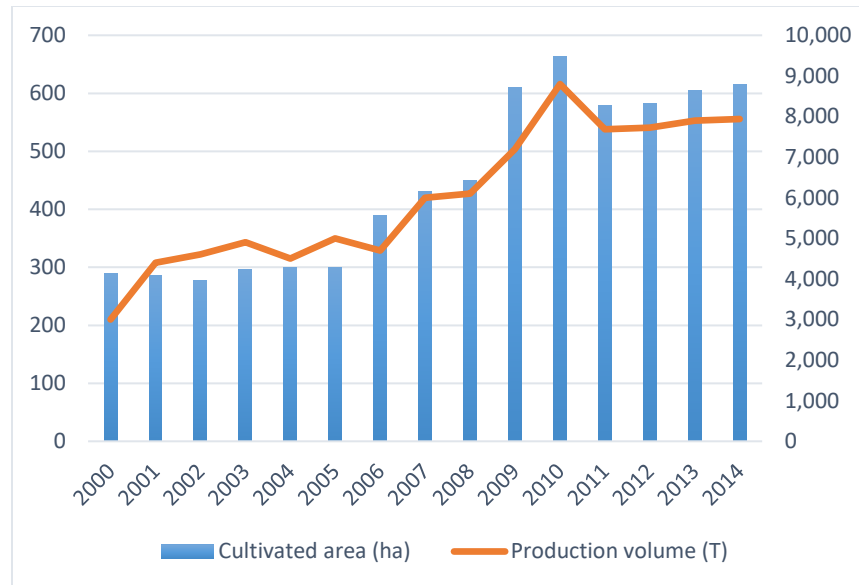


Figure.3. Avocado cultivated area and production volume (2000-2014)
Source (FAOSTAT)

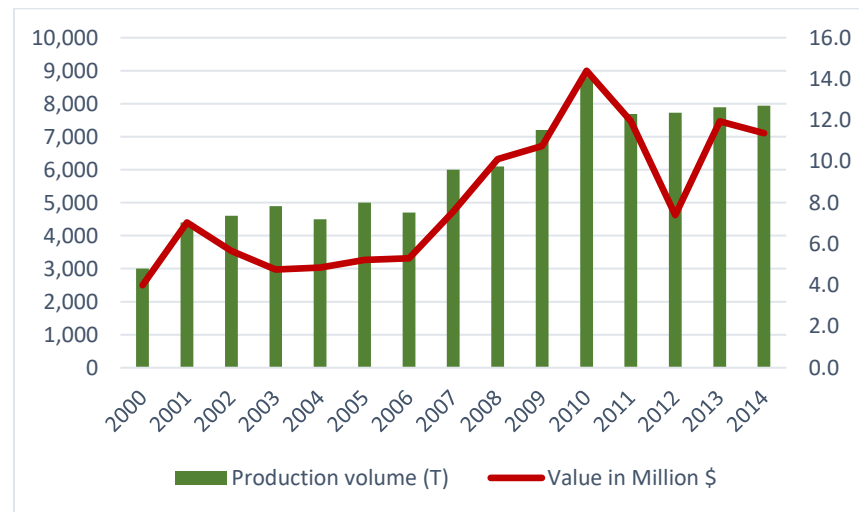


Figure.4. Avocado production volume and value (2000-2014)
Source (FAOSTAT)

¹ The first Avocado orchards were planted by Lebanese expatriates returning from Africa and who brought some seeds of Avocado fruits with them.

² Producers used Brokaw Nursery because it had conducted trials in Lebanon and made specific recommendations for rootstock suitable for Lebanon's soils and climate.

Between 2000 and 2005³, Avocado production in Lebanon remain stable. The cultivated area did not exceed 300 ha and the highest production was registered in 2005 with 5,000 MT⁴. After 2005, avocado production witnessed a rapid expansion. In 5 years the cultivated area almost doubled from 390 ha in 2006 producing 4,700 MT, compared to 664 ha and 8,799 MT in 2010. This growth was due to professional farmers and big landowners who saw the long-term potential of avocados and started to intercrop avocados within their banana plantations. Some of these landowners invested with the wood daman⁵ and established orchards using imported seedlings between 2000 and 2014.

Avocado intercropping with Banana plantations

Current production practices in Lebanon suggest that intercropping with bananas has proven to be an acceptable model, as farmers are able to realize income from bananas after one year, while waiting for the avocado orchards to come into production. However, bananas have very different water and pesticide requirements, and it is unclear how the increased pesticide and fertilizer use will affect the avocado orchards in the long term. In addition, the water requirements of bananas have most likely contributed to the incidences of root rot among avocado trees. This can be mitigated with the use of drip irrigation.

Smaller farmers⁶ who were in many cases imitating the practice of the wealthier and big farmers, planted new orchards with avocados grown from seed, which resulted in poor tree growth, inconsistent production, and non-commercial avocado varieties sold at low prices. Consequently, after 2010, the avocado cultivated area registered a slight decrease reaching 615 ha in 2014 with a production volume of 7,936 MT. As for the production value, it dropped to \$11.4 million in 2014 after registering its highest value in 2010 with \$14.4 million.

Lebanese avocado harvest takes place between September and early June, depending on varieties. Pinkerton, Fuerte, Reed, Hass, and Lambhass account for the majority of all production⁷.

The Hass variety is the most popular due to its high value and popularity among consumers, including its small seed size, high oil content, extended fruiting season, and its skin which turns from green to black when ripe, enabling consumers to easily identify those which can be eaten immediately. Ettinger variety, referred to as 'Atunga' by growers and traders, is gaining popularity due to its large fruit size, up to 0.5 kg per fruit, and high oil content. According to FAO, production yields in Lebanon are among the highest in the MENA region with 12.9 MT/ha in 2014⁸, compared to 11.9 MT/ha in Israel.

³ In 2005, the Hariri Foundation, with USAID funding, launched programs to commercialize the industry through trainings, demonstration farms, and the establishment of a nursery to promote conversion to commercial varieties.

⁴ MT: Metric Ton

⁵ Wood daman are professional farmers who rely on agriculture as a primary source of income. They typically rent large orchards from wealthy families, and supplement their production with that of small farmers.

⁶ Small Avocado farmers constitute 90% of the total number of Avocado farmers and account for 47% of the crop cultivated area. The orchards size of small farmers ranged between 0.1 and 0.5 ha.

⁷ Statistics for the production of Avocado per variety are not available.

⁸ The highest production yield in Lebanon for the last 15 years was registered in 2005 with 16.7 T/ha. Some professional Avocado orchards owners and managers estimate that applying best agricultural practices and selecting the adequate varieties could increase the yield to an optimal level of 40 T/ha.

III.1.1. Orchard management

Avocado orchard management requires significantly less pesticide and fertilizer application than comparable crops such as citrus and bananas. As with most tree crops, the most critical element is sourcing quality rootstock. Routine maintenance including irrigating, pruning, fertilizing, thinning and disease/pest control is also very important to orchard performance.

Prior to its intervention in the AVC, LIVCD noticed that Avocado growers relied on trial and error and advice from a more experienced grower, nursery owner, or input supply providers, to determine best practices to maintain their avocado orchards. There was little consistency between production practices in different orchards, with growers using different spacing, fertilization, irrigation and pest control practices. Pruning and thinning practices were limited in Lebanon, however fruit quality did not seem to be impacted. Anecdotally growers claim that avocado trees can remain productive for 100 years as long as the rootstock is from a quality source, disease-free, and the orchard is well maintained. From time of planting, trees will begin to produce after three years, reach commercial production in seven years and reach peak production after twelve years⁹. There was no professionalism in grafting techniques adopted by farmers before the LIVCD intervention. Good grafting practices were limited to some agricultural engineers and very few avocado experts.

Avocado farmers receive little extension support from the MOA. Big and wealthy landowners hire specialists for advice. Smaller farmers have virtually no source of advice on improved techniques and often rely on neighbors or the local nursery for advice, or in some cases input suppliers. There is only one NGO “Hariri Foundation” providing extension services to avocado farmers in South Lebanon.

When it comes to harvesting, avocado fruits are handpicked, by laborers climbing the trees as opposed to hydraulic ladders as are used widely abroad. This practice often results in tree limb breakage. Fruit is picked into large plastic crates that contain approximately 18 kg. Orchard managers typically recruit a family, to reside in the orchard to provide most of the labor requirements. Additional labor, are hired on a daily or seasonal basis.

As for post-harvesting, Avocado fruits have long storage life and do not require cold storage. In Lebanon, they are harvested and sorted directly in the field according to size and variety. Some varietal mixing does occur between “green” varieties such as Pinkerton and Ettinger, but Hass is generally packed by itself. Fruits are usually stored in an enclosed space or delivered directly to the wholesale market. The wholesale market does not provide any type of value addition other than facilitating commercial distribution to the end market.

Presently there are no special packing units for avocado, except in the case of some exporters who pack avocado fruits on their premises in different package specification as required by the export market destination.

⁹ Once peak production is reached, production can maintain at this level for 50 years.

III.1.2. Production cost and revenue

Before the LIVCD intervention the cost of production¹⁰ for avocado ranged between \$5,333 (8,000,000 LBP)¹¹ and \$8,000 (12,000,000 LBP) for a 1 ha orchard. This cost depends on the farming practices adopted by the farmer and the level of professionalism, the age of the orchard, and the farm size¹².

Assuming an average yield sold of 14 MT/ha based on the statistics of the cultivated area and production volume for the period 2000 to 2014 (Cf. Figure.1 p.11), and with an average farm gate price of 1.33 \$/kg for the same period, and an average cost of production estimated at 6,666 \$/ha, we can calculate the revenue generated per 1 ha Avocado orchard, where:

$$R = (Y \times P) - Cp$$

R (Revenue LBP/ha)

Y (Yield: Kg/ha), $Y = \frac{Vp}{Ca}$ (Vp: Total Volume of production in Kg and Ca: Total cultivated area in ha)

P (Farm gate price: LBP/Kg)

Cp (Cost of production LBP/ha)

$$R = (14,000 \times 1.3333) - 6,666 = \mathbf{12,000 \$/ha}$$

When compared to the main crops cultivated in the same area, citrus and banana, a well-established and productive Avocado orchard has a significantly higher revenue due to the lower production cost and better market price. (Table.5)

Table.5. Cost-revenue comparison between Avocado, Banana, and Citrus

	Avocado	Banana	Citrus
Cost of production (\$/ha)	6,666	8,000	8,000
Value of sales (\$/ha)	18,666	14,666	10,000
Revenue (\$/ha)	12,000	6,666	2,000

In terms of initial investment, establishing a 1 ha Avocado orchard costs approximately between 25,000 and \$45,000 excluding the price of the land and based on assumption that water is available. It is almost similar to the cost of establishing a Banana orchard, with the difference that Bananas will be productive from the first year, whereas Avocado orchards need three years from time of plantation.

According to the feasibility and business plans prepared by the LIVCD team to support farmers in establishing new Avocado orchards through Kafalat loans, the payback period (return on investment) is achieved after 4.5 years, assuming that the orchard will be productive after the third year.

¹⁰ The cost of production includes: irrigation (cost of water when not available + cost of energy for water pumping), fertilization, pest management, harvesting, orchard and infrastructure maintenance, and in some cases land rental.

¹¹ Currency exchange 1 \$ = 1,500 LBP

¹² Large farms and orchards benefit from economy of scale by getting discounts on the price of inputs.

III.2. Avocado market

According to Lebanese farmers, Avocado has the potential to be one of the most profitable crops on the market. Almost no avocado goes to waste with the entire crop sold at an acceptable price. LIVCD team estimated that 70% of Avocado fruits are sorted in the field during harvest into Grade I, 25% Grade II, and 5% Grade III¹³. Grading is by size and shape with round fruit with no dents or indentations and a matte green color being considered Grade I.

Domestic avocado consumption is estimated at 90% of the local production with an average farm gate price of \$1.6 and \$2.3 for the wholesale price. Avocado price on the domestic market correlates with the local production cycle (September through June). Avocado prices depend on variety and market timing, with late season products receiving a premium over early season products. For example, Lambhass can be harvested in late March through June. In that time span, wholesale prices start at 3 \$/kg in March, and then incrementally rise to around 6 \$/kg in early June when the demand becomes much higher than the supply. Growers that can keep fruit on the tree into late June and early July may receive 8 \$/kg. Prices of other commercial avocado varieties follow the same pattern, though prices are 30 to 50% less than Lambhass, which is considered to be the preferred variety. **(Figure.5)**

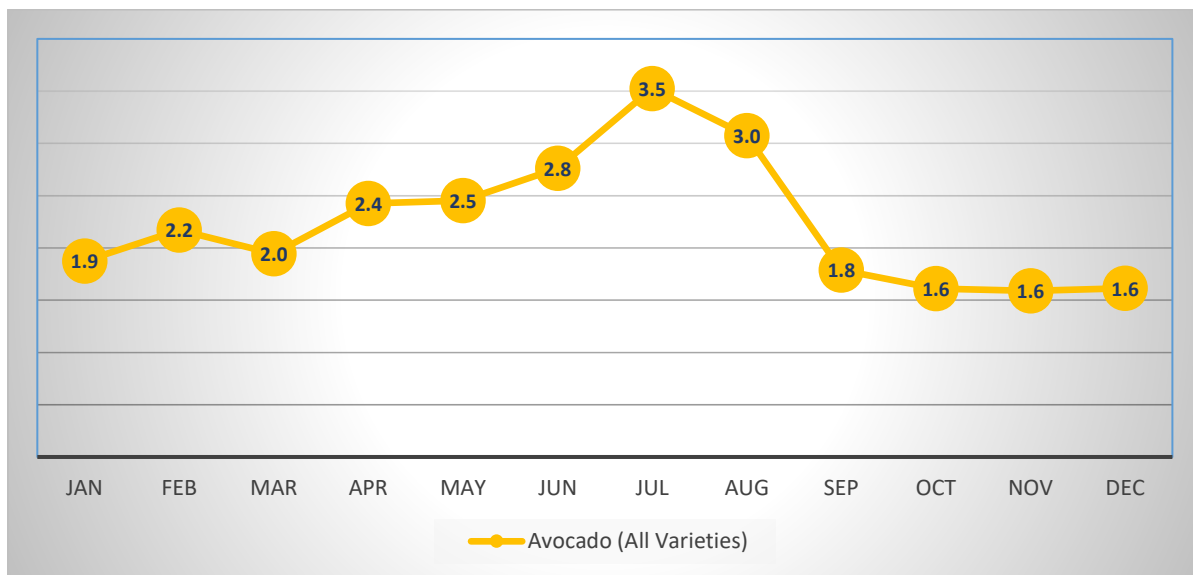


Figure.5. Average price of avocado varieties in year 2014 on Lebanese wholesale markets

Source (Chamber of Commerce Industry and Agriculture in Beirut - CCIAB)

Lebanese orchards produce many non-commercial varieties which receive the lowest prices at the wholesale market, ranging between 0.6 and 1 \$/kg. However, the ability to control the supply of avocados in the market by keeping the fruit on the tree or farm provides growers some leverage in setting the price. November through March is the peak production times and the largest in terms of volume traded.

¹³ International grading classifications, Extra, Class I and Class II are not used in Lebanon.

Lebanon's per capita consumption of avocado was estimated by FAO at 1.8 Kg in 2011 and around 2 kg in 2014, which is relatively high compared to the MENA region and Europe. Avocado consumption is becoming more popular at household level as well as within the HORECA industry (Hotels Restaurants Catering).

There are three main market channels for avocado in Lebanon: Direct sales; Wholesale market; and Export market.

III.2.1. Direct sales channel

Transactions in this channel are limited to direct sales between farmers and end-consumers or retailers. It is used by most small farmers with land size less than 0.5 ha). Representing 90% of the Avocado farmers, they produce around 47% of the total production, and sell around 70% of it through this channel. Very small farmers (less than 0.1 hectare) use direct sales targeting their friends/families. Small farmers use this channel to bypass the middleman and retain the additional margins for themselves; they target their friends/families and some retailers and F&B businesses.

III.2.2. Middlemen channel

Sales through middlemen represent the largest portion of the avocado market with around 60% of the total production passing through the wholesale market and fruits & vegetables distributors. The wholesale operator and his buyer set the price, but producers have much more control of supply (therefore price) due to avocado's ability to store on the tree and long shelf life once harvested. Distributors and retailers serving restaurants or end consumers directly are constrained by fixed margins and have limited ability to add value.

Restaurants and juice stands have the potential to generate the greatest value addition, and their margins will depend on the branding of the establishment.¹⁴ Middlemen channels used by some small farmers and most of the medium and big farmers (with land size exceeding 0.5 ha) are characterized by three routes:

- *Short route* with two transactions: in this case, medium and large farmers sell directly to a wholesaler in Saida market¹⁵ who in turn sells to the retailer.
- *Medium route* with three to four transactions: medium and large farmers sell to Saida or other wholesale markets; wholesalers sell to distributors, who in turn sell to retailers.
- *Long route* with more than four transactions: small and medium farmers sell to larger farmers or daman; the daman in turn sells to the Saida wholesale market; the Saida wholesaler in turn sells to a wholesaler in Beirut or Tripoli, who then sells to a distributor linked to the retailer.

Approximately 80% of avocados produced in Lebanon delivered to the Saida wholesale market are resold to the Beirut (Sports City) wholesale market (70%) and Tripoli wholesale markets (10%). The remaining 20% of deliveries to Saida are sold to Saida's juice stands, restaurants, retailers and hotels, or to the other wholesale markets in Lebanon. In Beirut, avocados are sold to restaurants, juice-stands, hotels, retailers and exporters, either directly from the wholesale

¹⁴ A sandwich shop offering chicken avocado sandwich on its menu operates on a lower margin than a trendy sushi restaurant that includes avocado in its sushi rolls.

¹⁵ Saida wholesale market is the main trading hub for Lebanese avocados, receiving more than 50% of total production. Around 30-40% goes to the wholesale market in Tyr. The remaining 10-20% is sold directly to Beirut wholesale market or exporters.

market or through distributors. At the wholesale level, avocados are traded in standard plastic crates containing around 18 kg of fruit.

III.2.3. Export market

Lebanese Avocado export follow three main routes:

- *Short route*: big farmer/daman sells directly to the exporter.
- *Medium route*: farmers sell to wholesalers in Saida market who in turn sell to an exporter.
- *Long route*: a farmer sells to the Saida market where the wholesaler sells to another one in Beirut market who in turn sells to the exporter.

Avocado export represents a small but growing market channel for Lebanese Avocado. Between 2013 and 2017 it accounted on average for 9% of the total domestic production. According to the Lebanese Customs, in 2013 the total export volume was 871 MT (29% increase over 2011) for a value of \$0.6 million. In 2017 Avocado export was estimated at 887 MT for a value of \$0.7 Million. Lebanon mainly exports its avocados to the GCC (primarily Saudi Arabia, Qatar, and Kuwait) and Jordan. (**Figure.6**)

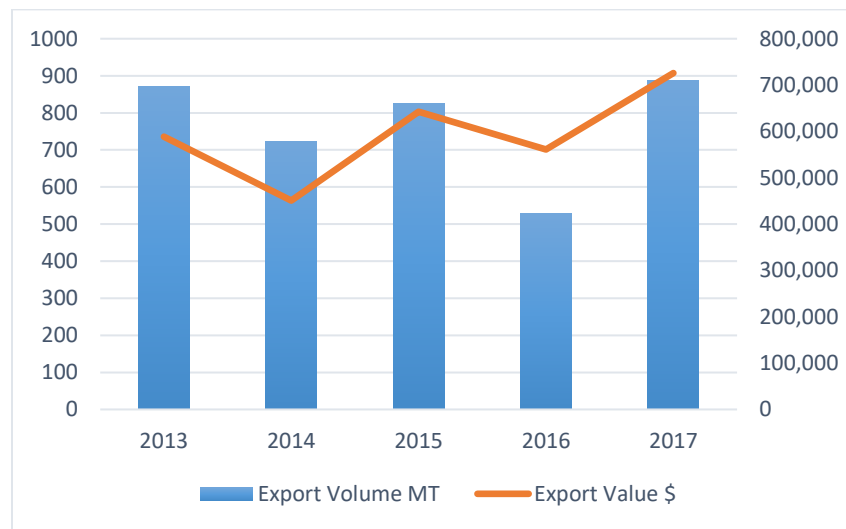


Figure.6. Avocado export volume and value between 2013 and 2017

Source (www.customs.gov.lb)

The initial assessment made by LIVCD team identified the lack of knowledge among avocado producers for the European market requirements and the high comparative advantage and competition from Israel, South America and Africa, as main constraints to develop the Lebanese Avocado export market especially in Europe which offers a great potential market.

Avocado Processing

Before the LIVCD intervention there was no industrial processing of avocados in Lebanon. Production of Avocado Oil has been identified as a potential value added option, as avocado oil is very suitable for cosmetics and cooking¹⁶. The oil is produced using the same “cold-press” equipment used by modern olive oil producers and is classified as extra virgin or virgin using olive oil standards. One ton of avocados yields up to 250 liters of oil depending on variety, climatic condition and harvest time. International wholesale prices of avocado oil were estimated by the LIVCD team at the beginning of the project to be 8 to \$12 per liter for industrial grade and 15 to \$25 per liter for food grade avocado oil.

III.3. Avocado Value Chain: operators and structure

This section lists the different operators and stakeholders involved in the Avocado VC. The facts and figures included in this part of the study take into consideration the FAO and MOA statistics for the year 2010 and the LIVCD assessment conduct in 2014 at the beginning of the project and before any intervention.

III.3.1. Input supply, nurseries, and other services providers

Input supply in Lebanon (irrigation systems, fertilizers, pesticides) is controlled by the private sector. Inputs are readily available in the market with more than 200 suppliers and distributors located all over Lebanon, among which 50 are located on the Lebanese coastal strip and provide extension and supply services for the Avocado farmers. In general input sales are made on credit, as farmers need supplies at the beginning of the season. Input suppliers provide also extension services to farmers along with the promotion of their products.

The diversity in avocado trees size and shape observed by the LIVCD team confirms that genetic material used in Lebanon is from different and multiple sources. Certified seedlings are not locally produced in Lebanon, but growers can purchase locally produced, seed propagated seedlings available in 13 specialized nurseries dealing with tropical fruit trees located along the Lebanese coastal strip, in addition to more than 20 general nurseries. LIVCD team estimated that the 13 specialized nurseries produced/imported around 70,000 Avocado seedlings in 2014 and sold around 40,000 with the other 30,000 remaining as stock.

Locally produced seedlings price depends on depending on the age and size of the seedling and if it is grafted or not, with an average a price of \$8. Only one local nursery distributes imported certified seedlings with an average price of \$15 per seedling. The seedlings are mainly purchased by farmers for orchard production and also by individuals for private gardens. Imported rootstocks from Europe and US and grafted with local scions.

Land preparation services are provided by individuals owning tractors or some big farmers who rent their own tractors to small farmers. As for grafting, a very important practice affecting the productivity of the avocado tree, before the LIVCD intervention there were no specialized and trained labor except for some professional agricultural engineers and very few experts. The

¹⁶ Avocado oil is used as an ingredient in a wide array of beauty care products. The oil has high concentrations of Vitamins A, D and E and is considered to have one of the highest skin penetration rates among all cosmetic oils.

LIVCD intervention in the Avocado VC trained 27 persons on grafting techniques, among which 20 are practicing this activity as complementary source of income, and 2 as primary source.

III.3.2. Avocado producers

According to the Lebanese Ministry of Agriculture (MOA) there were 3,700 avocado farmers in 2010. Based on their size, these farmers could be classified into four categories. (**Table.6**)

Table.6. Avocado farmers' characteristics

Category	Profile	% of farmers	Average farm size (in ha)	% of cultivated land	Production in MT (2014)	Market channel
Very small	Hobbyist farmers who do not rely on farming as source of income	68%	< 0.1	25%	1,984 MT	Household consumption
Small	Rely on agriculture as main activity but they have other source of income	22%	0.1 to 0.5	22%	1,746 MT	Sell their production to Wood daman
Medium	Rely on agriculture as primary source of income	8%	0.5 to 2	29%	2,301 MT	The majority bypass the daman and sell directly to the wholesale market
Big	Professional farmers who manage large rented orchards and serve as 'wood' daman. They provide the orchard owner with a fixed annual rental price. They have full control over production and sales	2%	>2	24%	1,905 MT	Serve as aggregators to small farmers and sell directly to the wholesale market and some exporters

III.3.3. Market operators

Wholesale markets are run by associations of traders who occupy designated spaces, collect rent for the warehouses, and organize cleaning and security. All traders deal in a variety of fresh fruit and vegetables. A portion of traders in the market are also independent exporters/importers of fresh product who own packing facilities and cold storage outside. The operations of wholesale markets in Lebanon are the source of some discontent among farmers and damans. Dissatisfaction centers around the lack of transparency in the dominant trade practice of consignment sales, in which no price is contracted at delivery with prices fixed by the trader according to market conditions. The Saida and Tyr wholesale markets are the main delivery point for avocado farmers and/or daman, among which an important part is resold through Beirut wholesale market.

Distributors assemble a variety of fresh produce from the wholesale markets and directly from farmers and deliver them on a regular schedule to retailers or HORECA operators who do not want to go to the urban wholesale markets on a daily basis.

There are 2 main types of distributors:

- *Independent distributors* who market mainly to upper-level restaurants and hotels under contractual agreements.
- *Integrated distributors* who generally lease space or pay a commission fee to run the produce department of supermarkets. Most independent supermarkets in Lebanon operate with these types of embedded integrated distributors, versus the chain supermarkets who buy directly and manage their own produce departments.

Retailers selling avocado to the end-consumers are made up of:

- *Small neighborhood shops* who make daily trips to the wholesale markets to procure their products. They do not offer consistent supply of Avocado in terms of quality and quantity.
- *Specialized shops* selling high end value fruits and vegetables, organic food, and specialty food, are trending in Beirut and the major urban hubs. They differentiate themselves in terms of product quality and the physical layout of the store. Such retailers make a more concerted effort to source the best produce from the wholesale markets or directly from farmers or damans. This category of retail shop offers consistent supply of Avocado.
- *Supermarkets* (mainly chains) are rapidly expanding. They manage their own fruits and vegetables purchasing units. As for independent supermarkets, they work with integrated distributors as produce department contractors.

HORECA industry consuming avocado is formed mainly of:

- *Hotels and restaurants*: provide an important market for all qualities of avocados included on the menus of restaurants ranging from sushi to sandwiches kiosks. Distributors supply most restaurants and hotels, although some send their own trucks to the wholesale markets.
- *Juice stands and fruit cocktail shops*: they transform fresh avocado to puree as a standalone item or as part of a fruit-chunk cocktail. Avocado puree is very popular item in Lebanon and the study team estimates that juice stands account for the highest consumption in Lebanon. In order to produce a thick, rich and creamy puree, juice stands require known varieties with high oil content.

Avocado exporters belong to the Fresh Fruit and Vegetable Export Syndicate. The number of exporter/packers dealing with Avocado has increased over the past 10 years due to the high profits made with this produce. The full-time traders have established links with buyers in higher end retailers and pursue opportunistic deals as well as longer-term purchase agreements. These diversified exporters typically send mixed loads to their destinations, they deal with Avocado as a profitable produce that can cover the losses occurred by other fruits and vegetables. The mixed loads are sent by airfreight, and may include multiple containers if by land or sea freight.

III.3.4. Access to finance

Most avocado producers are self-financed or work on credit obtained from input suppliers and/or wholesale traders. These loans cover the costs of production and harvesting. In most cases the loan includes a mutual agreement for the farmer to sell his product to the wholesaler at market prices. In rare cases the lender will charge interest. In some cases, landowners who rent to wood

daman are financing the establishment of orchards on their properties. This is unique among tree crops in Lebanon and attests to the commercial potential that these businessmen see in avocados.

Private sector financing and bank loans to the agriculture sector are limited. This results in a lack of investment, which is detrimental to the performance and competitiveness of agricultural activities and production. In 2010, only 1% of the farmers and holdings used the conventional agricultural credit and financing services provided by the banks¹⁷.

Small farmers have a very limited access to agricultural credit due to the high degree of risk associated with the management of small loans to agriculture. Before the LIVCD intervention there was very limited investment in new Avocado orchards relying on bank loans. In an attempt to address the problem of agricultural financing, the government established in 2000 “Kafalat”¹⁸ in partnership with private banks. Kafalat is a Lebanese capital firm of public interest. Its objective is to support farmers and Small and Medium Enterprises (SMEs) in having improved access to finance. Kafalat provides loan guarantees based on feasibility studies that demonstrate the viability of the proposed economic activity¹⁹. In its action plan for the Avocado VC, LIVCD aimed at helping young farmers apply to Kafalat through support in preparation of business plans.

The marginalization of many small farmers from access to commercial bank loans has led to the expansion of micro-credit programs with more than ten main institutions working in Lebanon. In 2014, nine institutions formed an informal microfinance federation with the support of the Lebanon Investment in Microfinance (LIM) program, funded by the USAID. On the other hand, informal credit systems and networks are also very powerful especially with small and poor farmers, where the main actors are input suppliers and wholesalers in the agricultural market who give credit to farmers at the beginning of the season, often in the form of deferred payment. Such credit is usually accompanied by very high interest rate, but sometimes it is the only option for farmers.

III.3.5. Other stakeholders

Other stakeholders having an influence on the AVC mainly on the institutional level, business enabling environment, and research/ knowledge dissemination field are:

The Ministry of Agriculture (MOA) the main institutional actor responsible of the agricultural sector. Among its main responsibilities, the MOA plays an important role in: 1) regulating the agricultural production, food processing, marketing, as well as agricultural trade; 2) controlling and monitoring the legislative framework; and 3) supporting the sector development including: the provision of extension services, planning and coordinating projects related to the sector, and documentation and statistics. Three other institutions are affiliated to the MOA:

- *The Green Plan* an entity that could be considered as a department for rural development, operating in autonomy but under the supervision of the ministry. It is an executive body in charge of rural infrastructure, i.e. farm-level irrigation, agricultural roads, and reclamation of agricultural land.

¹⁷ According to Darwish 2008, bank loans to farms account for only 2% of bank credit.

(DARWISH. S, 2008. L’agriculture, l’agro-alimentaire, la pêche et le développement rural. In : Les agricultures méditerranéennes. Options Méditerranéennes, Série B/n°6, Ed. Les Monographies du CIHEAM, pp 141-164.)

¹⁸ www.kafalat.com.lb

¹⁹ According to the type of production, farmers can benefit from a grace period ranging between 1 and 3 years. Kafalat loans can reach 300,000 \$ per project.

- *The Lebanese Agriculture Research Institute (LARI)* has its own independent budget, and it is in charge of research and provision of extension services to farmers. LARI has 8 research stations spread all over the Lebanese territory with different laboratories specialized in specific plant and animal production systems, as well as irrigation and food safety.
- *The General Directorate for Cooperatives*, which covers all cooperatives and not just agricultural cooperatives. Its mission includes 1) legal and financial control over cooperatives; 2) technical and management training; 3) economic and statistical follow-up of cooperatives.

Other public stakeholders playing an important role with regards to agricultural development²⁰ and that might affect the performance of the Avocado VC are the Ministry of Energy and Water (MOEW) responsible of large irrigation programs and water resources management, as well as the Litani River Authority (LRA) and the Council for Reconstruction and Development (CDR). The LIBNOR is responsible of norms and standards elaboration, and the Industrial Research Institute (IRI) performs laboratory tests on food quality.

The Investment Development Authority of Lebanon (IDAL) is the national investment promotion agency, established in 1994 and is working to promote and facilitate investment in Lebanon as well as to market Lebanese exports including agricultural and agro-industrial products. As part of its latter overall objective, IDAL has established the Agri-Plus program, with a budget of about \$33.3 million for export subsidies, it aims at opening new markets for Lebanese agricultural produce²¹.

The Federation of Chambers of Commerce, Industry and Agriculture in Lebanon (FCCIAL) was established in 1997 as the national umbrella of the four regional Chambers in Lebanon: Beirut and Mount Lebanon (CCIABML): more than 15,000 members; Saida and the South (CCIAS) with 7,000 active members; Tripoli and the North (CCIAT) 6,000 members; and Zahle and the Bekaa (CCIAZ) 15,000 members. The regional Chambers, including the Federation are active organizations with useful services for their members. Agriculture and agro-processing are priority sectors, which results in various services, including:

- Support members in export development and export promotion (trade fairs).
- Training and workshops on management skills, food safety, business development and financial management.
- Providing information on market access requirements, consumer needs, and specific market information.
- Laboratory services (in the north, in the Bekaa and in the south).
- Technical assistance and extension.

Agricultural cooperatives: despite the high number of cooperatives in Lebanon²², very few are specialized with Avocado production. According to the MOA census of 2010, the agricultural cooperatives cover 162,731 farmers and food processors. Cooperatives are mainly based on

²⁰ This distribution of responsibilities has taken important policy tools and budgets away from the MOA.

²¹ After the Syrian crisis, IDAL was granted additional \$20 million subsidies from the government in order to support sea road export additional cost after the closure of the Syrian-Jordanian border.

²² According to the National Federation of Lebanese Cooperatives (NFLC), there are 799 general agricultural cooperatives (crop, animal, and food processing), 49 for beekeeping, and 42 for fishing.

village or regional level and specialized in specific value chains, many are not efficient, with fictitious members created to benefit from development projects.

Donors: since the end of the Lebanese war in 1990 many donors have supported the Lebanese agricultural sector through the implementation of development projects in coordination and cooperation with the MOA, other ministries, international organizations, NGOs, municipalities, and in some cases directly with the private sector. Most of these projects focused on rural development and livelihoods; increasing the sustainability of the sector; and improving products' quality and support for local and export markets. The FAO, European Union, UNDP, Italian Cooperation, French Agency for Development, and USAID are the main donors. Their interventions cover main value chains such as olive oil, apples, livestock, dairy products, and processed food. Interventions in the Avocado VC are limited to projects funded by USAID.

NGOs: more than twenty local NGOs are involved in agricultural development projects in Lebanon. They receive funds from different sources, and have partnerships with international NGOs and organizations, private sector, and in some cases public institutions. They mainly provide direct services to farmers through their own services' centers. The Hariri Foundation is among the most active in Saida and South Lebanon, particularly in the Avocado VC.

Research and education: Lebanon has a well-developed public and private university level education with five Universities offering a degree in agricultural engineering, as well as good research centers and laboratories affiliated to ministries and Universities. The agricultural technical education suffers from several weaknesses including the lack of interest in this field of education, insufficient budgets of the MOA, underdeveloped capacities of teaching staff, inadequate facilities and poor curricula that do not comply with the sector requirements and market demands in terms of new specializations.

Certification bodies: the certification market is still underdeveloped in Lebanon. There are few operators who provide this service: Bureau Veritas and TUV (Global GAP); IMC (organic production and IPM-Integrated Pest Management). Certification helps farmers and producers to improve the quality of their products and to access markets with higher prices. Certifiers are usually hired by farmers, processors, and some cooperatives that require a certain certification, most of the time in the framework of development projects. At present in the Avocado sector, certification is not practiced due to limited use of pesticides application. If needed in the future, fresh avocado certification will depend on the export market requirements.

III.4. Avocado value chain map and structure

Based on detailed description of the production and market characteristics presented in sections II.1 and II.2 and the stakeholders' roles explained in section II.3, the following figures represent the map and structure of the Avocado VC. The facts and figures included are for the year 2014 comparison baseline for the economic impact assessment in section III. (**Figure.7 and Figure.8**)

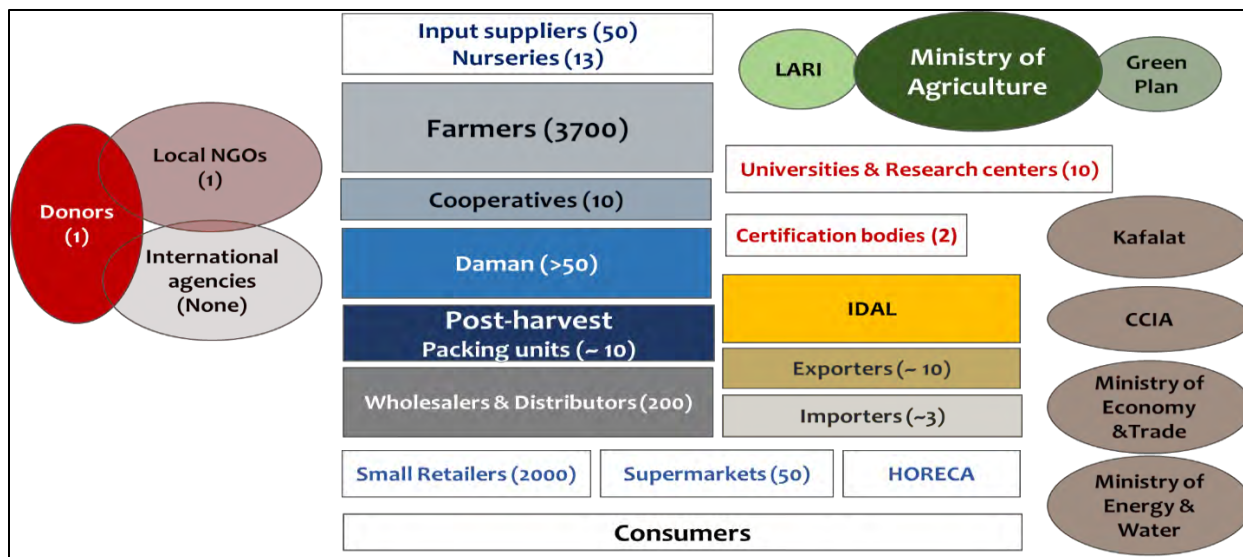


Figure.7. Stakeholders' map of the Avocado Value Chain

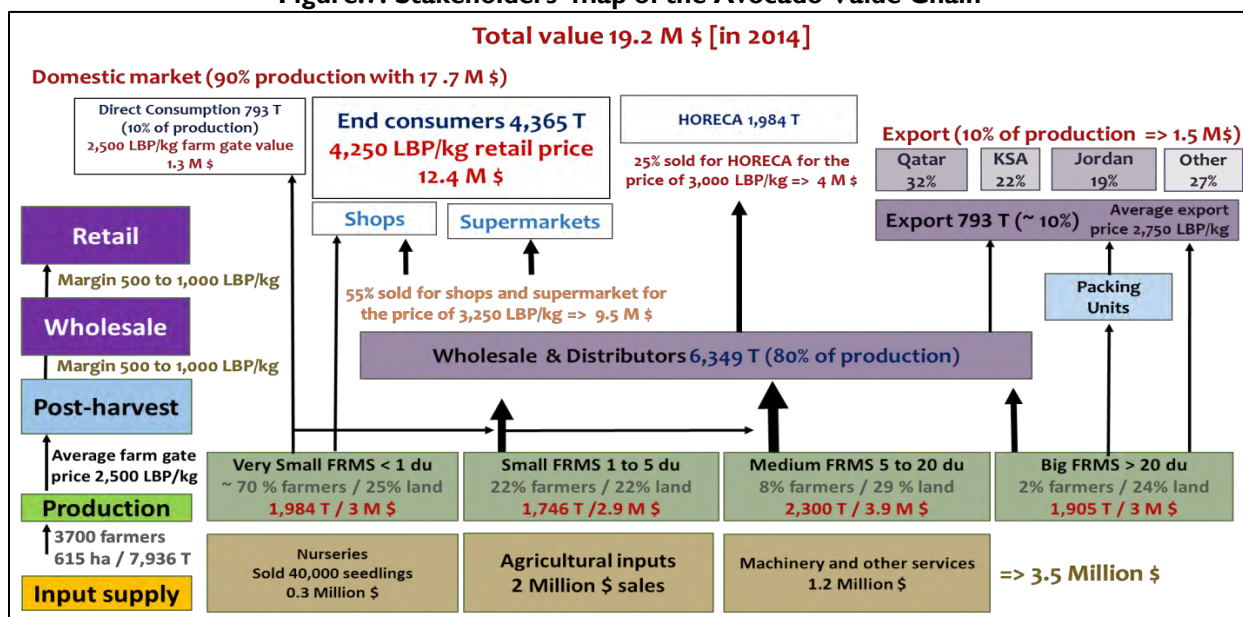


Figure.8. Structure of the Avocado Value Chain in 2014

The physical and financial flows of Figure.5 based on the statistics and estimations for the year 2014 show that the total economic value of the Avocado VC was \$19.2 million, with the biggest share for the domestic market (\$17.7 million) and only \$1.5 million for the export market²³.

²³ The difference between the export market value given by the Lebanese Customs (\$0.6 million) and the one estimated in Figure.5 (\$1.5 million) is due to the lower values declared by the exporters.

Conclusion and Perspectives

Despite the high economic impact ratio, the results of the assessment reveal that the three main axis of the LIVCD intervention and their objectives were not equally addressed and reached. The major impact done by the project was on the fresh avocado production and consumption on the local market (Axis I), which increased significantly and generated important positive economic impacts on the direct, indirect, and induced levels.

Increasing market shares in export markets (Axis II) registered a slight increase in terms of volume and value, this may be related to the export challenges faced in general by the Lebanese traders and farmers, and to the high demand for local consumption which is draining around 90% of the total production.

The project did not result in the introduction of Avocado processing to Lebanon (Axis III) due to two main reasons:

- The demand for fresh avocado varieties is very important in Lebanon and still increasing; it brings high profits for farmers who do not invest in industrial varieties.
- Due to their small scale, avocado producer cannot insure the necessary quantities needed for milling industry.

It was noticed during the economic assessment field work that Avocado orchard expansion will continue after the project ends. Most of the Avocado VC stakeholders expect that this trend will continue for the next five to ten years. Farmers entering this business are encouraged by the following factors:

- The relatively affordable investment cost.
- The low maintenance cost of orchards.
- The success showed during the LIVCD project intervention.
- The high potential revenue, especially when compared to citrus plantations.
- The increasing demand for fresh avocado on the local market.
- The potential to explore new export markets with a good ability to compete.

However, avocado orchards occupy some of the most valuable properties in Lebanon along the Southern Lebanese coast, which will create constant pressure on orchard owners to convert orchards into tourist, and infrastructure projects, and will likely deter most investors from purchasing property for agriculture purposes. Therefore, the search for new potential areas to introduce avocado orchards in areas that are less likely to be developed commercially such as in Akkar and mid altitude areas where land is less expensive is important to consider to maintain growth in the avocado sector

On the economic level, the results of this report prove the successful Value Chain approach intervention adopted by LIVCD for avocado. Despite its small size in terms of cultivated area and production volume, the avocado VC seems to have significant economic impacts and potentials as demonstrated in the economic impact assessment:

- The direct technical support provided by the project targeting around 600 farmers resulted in the improvement of the quality and quantity of avocado production. This is clearly reflected by the direct economic impact ratio estimated at \$2.65 for each \$1 spent by the project.
- The LIVCD intervention in the avocado VC has had positive returns not only for the farmers and direct beneficiaries, but also on the other actors within the VC who were able to benefit from this expansion and from the linkages created by the project to increase their income and grow their businesses. This is demonstrated in the indirect economic impact ratio estimated at \$7.84 for each \$1 spent by the project and the increase in the total value of the avocado VC from \$19.2 million to \$26.1 million (36%), and from 7,936 T in 2014 to 10,842 T in 2017. The production volume/value ratio remained almost the same with 2.4\$/kg. Based on the same production and consumption trends evaluated for the period 2014-2017, a 30% increase of the avocado VC value is projected for the coming three years to reach \$34 million in 2020. (Figure.9)

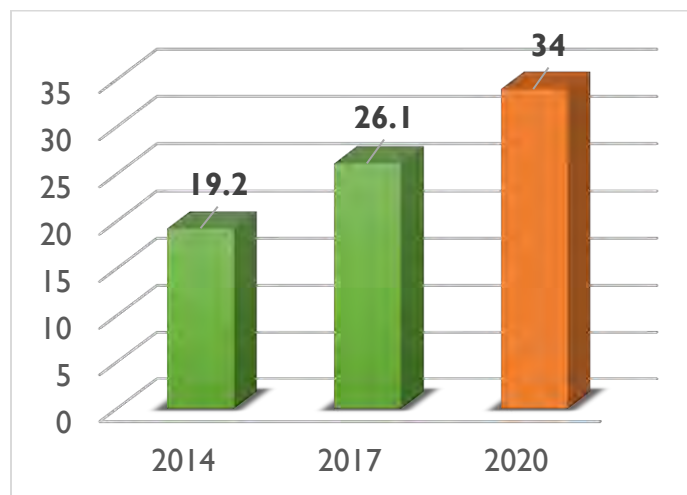


Figure.9. Evolution of the Avocado VC value in Million \$

- As for the facilitation of access to loans, the project intervention encouraged 44 farmers to invest in avocado production resulting in an induced economic impact ratio of \$7.25 for each \$1 spent by the project.

When observing the actual performance of the avocado VC and comparing it to the before project situation, it is noted that the LIVCD intervention has supported scale-up the avocado VC and enhance the existing trends driving the development process of the avocado production represented by the following factors:

- 1) Significant private sector investment attracted by the high profitability of avocado.
- 2) An increasing number of large and professional farmers who can make a difference in terms of production quality and quantity and scale up the value chain. An in depth study and full survey of the avocado VC should be conducted to determine the new distribution of avocado farmers according to their profile and farm size.

- 3) Conversion of non-profitable citrus plantations to avocado plantations. Based on the LIVCD field officers' estimation, around 5 to 10% of the total citrus cultivated areas was converted to avocado plantations between 2014 and 2017, mainly in the southern coastal plain. This trend is projected to increase in the coming five years, especially when the avocado orchards planted between 2014 and 2017 will reach their maturity and demonstrate their profitability, which will encourage more farmers to shift from citrus to avocado plantations.
- 4) The transfer of know-how and good agricultural practices to all avocado producers, more than 900, who are transforming their non-productive orchards to productive ones and/or investing in new orchards.