



Protect and Provide Livelihoods in Lebanon:

Tomato Value Chain Assessment

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INTRODUCTION

To support Lebanese host communities, Mercy Corps is launching a program entitled Protect and Provide Livelihoods in Lebanon (PPLL). The Overall Objective of the action is to mitigate the medium- to long-term impact of the Syrian refugee crisis on Lebanese host communities. The fear is that continued economic instability will lead to political volatility, as the financial pressure that the Lebanese have been placed under due to the Syrian crisis will manifest itself in conflict. The Action therefore has two objectives:

- Objective 1: Small and medium producers protect their livelihoods to adjust to the changing reality of the continuing Syrian crisis, and;
- Objective 2: Targeted Lebanese households and Syrian refugees have strengthened coping mechanisms for livelihood protection.

PPLL will prioritize interventions that allow smallholders to diversify their activities to exploit opportunities across two or more value chains or within a single value chain (e.g. various types of vegetables), thus maximizing income streams to producers over a greater period of time. Due to the focus on small and medium producers, PPLL will focus on cash crops but also include food crops used for household consumption where the surplus can be sold on the local market, but will avoid any crops where the WFP or other aid agencies are importing high quantities from outside Lebanon with the potential to distort the local market and decrease the value of local Lebanese crops.

The following value chain assessment presents an overview of the **tomato value chain** in the Bekaa Valley – particularly those market actors and factors that concern vulnerable Lebanese host communities who would be assisted under any PPLL intervention. The assessment includes a value chain map and narrative of the transactions involved. The report also includes a value chain analysis of the dynamic trends identified during field research, as well as the opportunities, constraints and risks facing PPLL as it seeks to intervene in the value chain to boost incomes for smallholders.



METHODOLOGY

In the first phase of the assessment, we engaged in a desk review of existing reports and projects in the tomato value chain. Specifically, we reviewed:

- Documentation of the Lebanese Recovery Fund projects, implemented by FAO and UNIDO
- Lists of greenhouse growers in the Bekaa, maintained by the Chamber of Commerce in Zahle
- Lebanese Ministry of Agriculture’s 2010 Agricultural Census
- Background information and best practices for each of the value chains

Based on beneficiary lists from past projects, information from the Chamber of Commerce, and the existing network of contacts of the field team, we assembled a list of key informants for the first round of interviews. Field teams met with each key informant for a semi-structured interview that took between 45 minutes and two hours. The interview covered topics like production process, production volumes, input prices, market prices, transport and storage of goods, marketing of goods, and challenges faced. We then used chain referral sampling to expand its informant base. During each interview, informants were asked about their suppliers, customers, and competitors. They were also asked who else they thought should be interviewed in the value chain. Where possible, they provided contact information.

We sought to interview actors from every step of the value chain, including input suppliers, large and small producers, wholesalers, processors, and exporters.

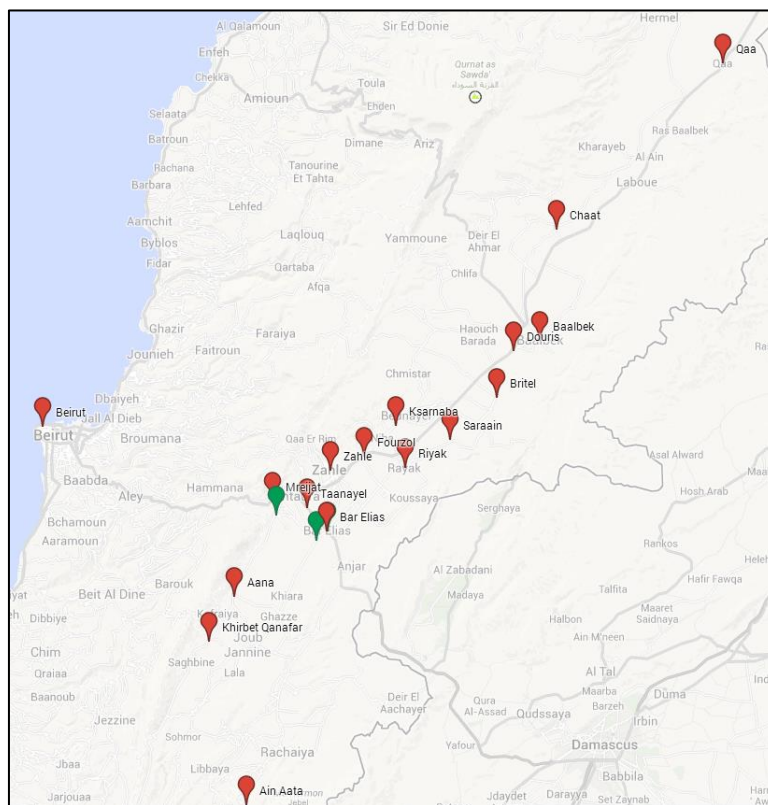
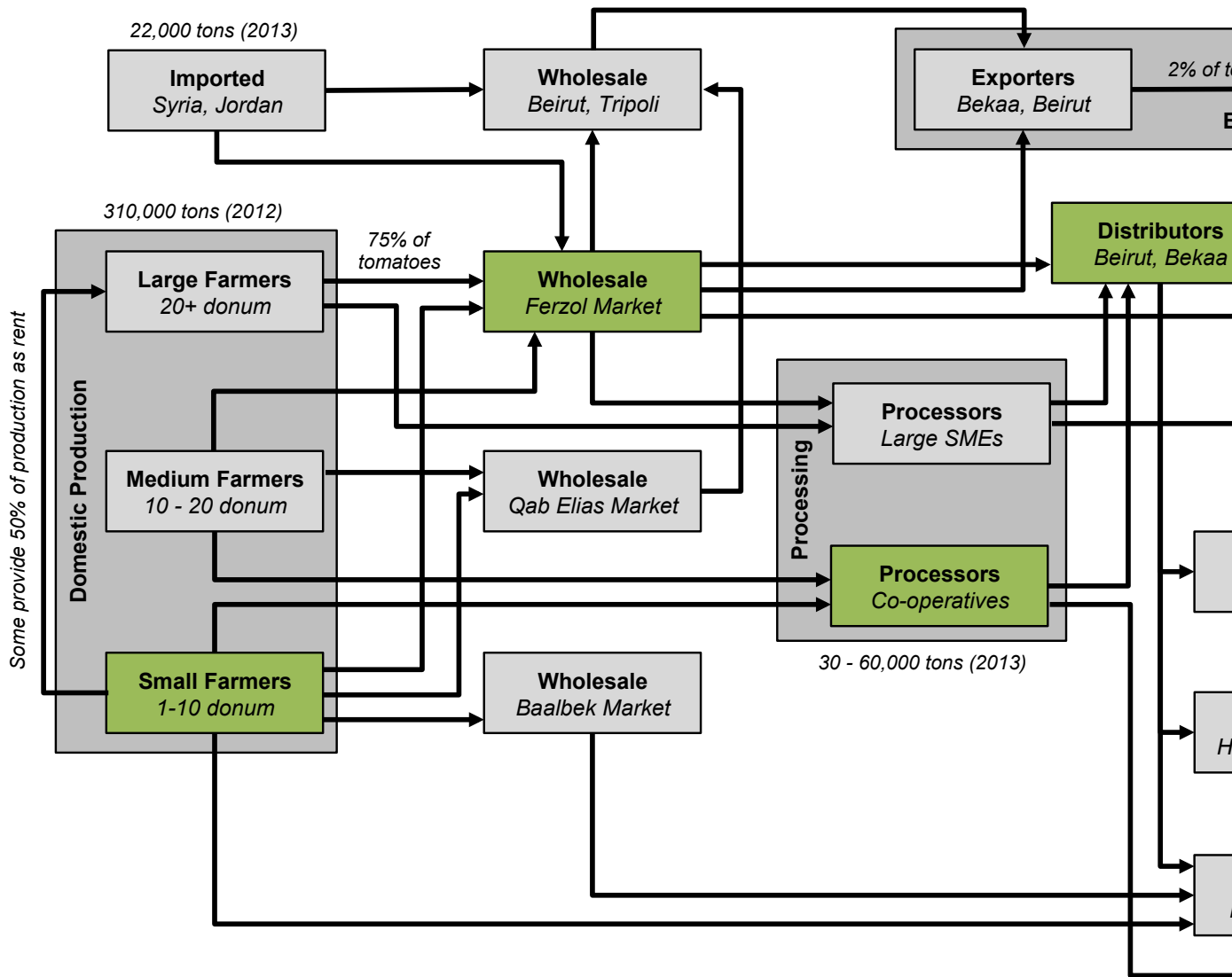


Figure 1. Map of Interview Locations



TOMATO VALUE CHAIN MAP



OMATO VALUE CHAIN

OVERVIEW

Based on the Ministry of Agriculture Census of 2010, there are 33,902 farms in the Bekaa region, covering 993,300 dunums, or 43% of the total usable agricultural space nationwide. Just under two thirds of that land, or 614,825 dunums, is used to grow seasonal crops.

Tomatoes are grown on 16,658 dunums of farmland in the Bekaa, approximately 22% of which are grown in greenhouses. This represents under 2% of farmland in the region, but accounts for 38% of the tomatoes grown nationwide. Based on FAOSTAT statistics and interviews, Lebanon produces 7 tons of tomatoes per dunum harvested. Therefore, approximately 116,606 tons of tomatoes were harvested in the Bekaa in 2010.

Based on customs data, Lebanese consumers consumed 295,741 tons of tomatoes—less than the 310,000 tons produced nationally. However, only 1,939 tons of tomatoes were exported and 18,680 tons were



imported. Total wastage is estimated at 7% - 10%, within the acceptable range for the agricultural standards

While tomatoes are grown in every region, the Baalbek region dominates tomato production with over 50% of open field production and greenhouses in Lebanon found in the Bekaa. While Zahle has the highest average farm size at 47 dunums, the Baalbek region has the highest number of large (over 20 dunums) farms, primarily around Baalbek and Chaat, as well as in Masharia Qaa.

Small farmers (under 10 dunums) are widely distributed throughout the region and make up about 55% of all farms, with Hermel and Western Bekaa having a larger proportion, at around 70%. Some 47% of farmers Zahle and Baalbek have less than 10 dunums.

Table 1. Land Used in Open Field Production of Tomatoes ¹

Caza	Irrigated land (ha)	No improved irrigation (ha)
West Bekaa	261.1	.5
Zahle	404.6	1.0
Baalbek	801.5	10.3
Hermel	118.1	.5
Rachaya	7.1	2.5
TOTAL	1,592.5	14.8

¹ 2010 MoA Agricultural Census.



Table 2. Land Used in Greenhouse Production of Tomatoes ²

Caza	Irrigated land (ha)
Bekaa el Gharbi	9.8
Zahle	6.9
Baalbek	26.6
Hermel	0
Rachaya	.5
TOTAL	43.7

PRODUCTION

Tomato production is generally limited to one season in the Bekaa, due to the need for crop rotation. A limited number of greenhouse farmers grow multiple seasons. Tomatoes are usually planted in April and May, once the danger of frost subsides. While varying slightly by region within the Bekaa, the tomato harvest generally begins in early June starting with greenhouse tomatoes then open field, peaking towards the end of June and continuing into late July/early August. More sophisticated farmers who use improved varieties and/or grafted seedlings and low tunnels plant earlier in order to capture early season prices. Greenhouse farmers that choose to grow a second season of tomatoes, start in September/October harvesting in December. This did not seem to be a common practice among growers. Total regional production volume averages about 300 tons/day during the primary growing season.

Table 3. Production Calendar for Tomatoes

Activity	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Greenhouse	X	O							
Low-Tunnel	X		O						
Open Field		X		O					
Greenhouse 2 nd						X		O	

* X = earliest planting, O = earliest harvest

Open field production of tomatoes costs \$1,400 per dunum, not including the costs of irrigation. This compares with an average of between \$700 - \$1,200 for an individual greenhouse, depending on production system and the use of hired versus family labor. This does not include the cost of the greenhouse itself (\$2,000 - \$3000), or irrigation (\$1,000 - \$1,200). Land rental prices vary by region and availability of water; prices range from \$125 - \$400 per dunum. The cost of planting a dunum of land or one greenhouse ranges from \$187 - \$250, including labor.

The use of low tunnel, or *nafaqs* is helpful to protect against frost, and encourages plant growth and early harvest. *Nafaq* production is more prevalent among farmers with over 20 dunums in production, and is not used by small farmers because of the cost and labor involved, about \$265 per dunum.

² *Ibid.*



As noted in Tables 1 and 2 above, most tomato production is done using drip irrigation in open fields and greenhouses. Open field tomatoes are irrigated up to three times per week, depending on weather, for about 3 hours. Tomatoes require about 1 – 1.5 liter/day, or 12-15 liters/week. One of the benefits of greenhouse production is limiting evaporation and reducing irrigation needs. Black plastic mulch is used by farmers in both open field and greenhouses to prevent weed growth and evaporation; it is used in conjunction with drip irrigation laid over the hoses. Plastic mulch comes in rolls of 18 – 21 kgs, and costs about \$60 per dunum, not including labor.

While drip irrigation is widely found throughout the Bekaa, there are small farmers in areas like Qaa, that only use flood irrigation due to the lack of water storage, and deep ground water table that makes drilling for wells prohibitively expensive. These farmers receive water through an unlined public canal system, which delivers water every 4 -5 days, depending on availability. This infrequency of irrigation not only wastes water, but also has negative effect on plant health, yield and fruit quality.

Sizing up farmers in the Bekaa

A majority of large farms (more than 20 dunums of tomato production) are found north of Zahle starting in Riyaaq, and in the Baalbek region extending to Qaa. These large farmers cultivate up to hundreds of dunums of tomatoes, especially in Masarieh Qaa. Large farmers own and rent land for their production. They do not engage in contract farming, or provide smaller farmers with inputs and buy back their production, although in some cases, large landholders like Skaff and Edde around Qab Elias, rent their land to smaller farmers and take about 50% of their production as payment.

Large farmers work with both national and regional input suppliers to procure seedlings, fertilizers and pesticides. These growers are considered sophisticated, using improved varieties, drip irrigation, *nafaqs*, plastic mulch, and employing full-time farm laborers. They account for over 75% of tomato production and sell directly to the wholesale markets, although a select few sell directly to exporters in Bekaa and Tripoli.

Medium-sized farms (with 10-20 dunums of tomato production) make up roughly about 13% - 15%³ of the total number of farms in the Bekaa, and average about 13 dunums in size. Usually they own their farm and invest in improvements to their business. They can produce on average up to 50 tons of tomatoes in open field production, or 140 tons of tomatoes in greenhouses per season.

These farmers make ideal candidates for demonstration plots as they can usually spare additional space, use improved irrigation, experiment with new varieties, and are open to new production techniques and are small enough to interact with smaller farmers in the area. They would serve well as a potential consolidator or marketer for new varieties grown in partnership with small farmers. Input suppliers recognize the links these farmers have with small producers and often cultivate relationships with these growers.

Small producers (with under 10 dunums of tomato production) are widely distributed throughout the Bekaa, and a majority of them are involved in vegetable production. On average about 20% of small farmers own greenhouses. The highest number of small farmers is found in Baalbek region, with over 7,000 farmers (or 50% of the local total) who have less than 10 dunums. In Zahle by contrast, small farmers make up only about 25% of the total number of farms.

Small farmers own or rent land. Generally, farmers that own land, or have long-term rental arrangements,

³ According to the 2010 MoA Census



through traditional family ties, are those with greenhouses. Small farmers that rent on a yearly arrangement will not take the risk of installing a greenhouse, and are more susceptible to land rental price increases, due to real estate development. Many small farmers in areas of Kefraya, Kerbet Qanafar and Ain Ana pay for the use of the land with 50% of their production. While this helps mitigate financial risk, it is a disincentive for investing in improved technologies to produce higher quality vegetables.

Varieties

Most Bekaa growers follow the practice of using indeterminate tomatoes inside greenhouses, and determinates for open field.⁴ There is widespread adoption of improved varieties of tomatoes led by the Vale F1 variety, which was commonly found in greenhouses of small and large farmers. The Vale F1 is an improved tomato with increased resistance to disease with better yields, about 7 tons per greenhouse. It produces in about 100 days. Open field production has a wider range of varieties, including Cristal, Baladi/Jordi, and Ammani, which yield about 5 to 6 tons per dunum on average (depending as well on growing practices). The Ammani variety seemed to be the most popular, and is used for both the fresh and processed market.

In general, however, there is a limited selection of tomato varieties to choose from, and all originate from large input suppliers who purchase directly from international seed companies. Seeds are re-sold to local input suppliers or directly sold to farmers. The varieties are chosen mostly for fruit size and yield, and all improved varieties have some form of disease resistance.



Low quality "Baladi" variety tomatoes

When planting, farmers do not seed directly, preferring to plant seedlings that bought from local nurseries. Farmers buy the seeds from an input supplier, and then give them to a nursery to germinate. Seeds cost anywhere from \$15/1000 seeds for the Baladi variety, and up to \$60/1000 seeds for the Vale variety. 1000 seeds are planted on one donum or one greenhouse. The price depends on quantity ordered with 25% discounts given on larger seed orders of over 10,000 seeds. Small farmers pick up the seedlings from the nursery, and hire laborers to help plant them in the fields. Larger farmers usually have them delivered and hire their own laborers or contract the input supplier to plant. Nurseries take anywhere from \$.17 - \$.25/seedling, again depending on quantity.

Growers also have the option of using grafted seedlings. The seedlings are taken from the nursery that germinated the seeds, and given to Robinson Agri or Mona Agri where the seeds are grafted onto improved eggplant rootstock. They are put in a healing chamber for about 3 to 5 days, and then delivered to the grower.

Grafted seedlings are used in greenhouse production and have better disease and drought resistance, better fruit set and quality, but the same yield. They are especially used in areas with *Fusarium wilt*, a common fungal

⁴ "Determinate varieties of tomatoes, also called "bush" tomatoes, are varieties that are bred to grow to a compact height (approx. 4 feet). They stop growing when fruit sets on the terminal or top bud, ripen all their crop at or near the same time (usually over a 2 week period), and then die. ... Indeterminate varieties of tomatoes are also called "vining" tomatoes. They will grow and produce fruit until killed by frost and can reach heights of up to 10 feet although 6 feet is considered the norm. They will bloom, set new fruit and ripen fruit all at the same time throughout the growing season."(Source: <http://faq.gardenweb.com/faq/lists/tomato/2000082337022708.html>)



disease. Grafted seedlings cost about \$.35 – \$.48/seedling.

Although some small farmers grow improved tomato varieties such as Vale and Ammani, their incentive to grow a high quality product is lower because of difficulties negotiating high prices with relatively low volume. Small farmers do not generally consolidate their production with others, preferring to sell directly to the wholesale markets several times per week during harvest season.

Common cultural practices

Greenhouse farmers use string as support for tomato plants. Tomato blossoms are not pollinated artificially, although some farmers tap the lines to induce pollination and encourage fruit set. This practice is not an effective method of pollination, as tomatoes should be pollinated by shaking or vibrating the stem behind the flower.



Tomato Greenhouse Production

Open field farmers do not support their plants, and leave the tomato touching the ground. Depending on the type of tomato plant grown, some farmers fold the vines back on top of the plant.

All farmers fertilize crops before planting, and every couple of weeks during the growing season. Fertilizers are bought from input suppliers, who give directions on use and application. Farmers generally follow directions given by input suppliers that seem to be accurate and misapplication of fertilizer is not common. However, due to lack of soil testing, growers cannot determine optimal fertilization requirements.

The misuse or inappropriate application of manure is key production problem highlighted by small farmers. Farmers do not know how to handle and/or apply animal manures. Some spread raw goat or sheep manure prior to planting, and then spray with pesticides a few weeks after to kill the resulting worms. Others put cow manure directly on plants, which burns the tomatoes from excess nitrogen.

Pesticides were generally used in accordance with input supplier directions, which encourages pesticide application. In interviews with traders, pesticide residues are a major issue, not due to over application but because farmers don't wait the allotted period prior to harvest (usually three days).

Small producers improve their production and learn about new varieties by watching what a lead farmer in the area is growing, and how he is planting, harvesting

and selling. Small producers purchase inputs from a local supplier and seek advice when faced with



Inappropriate use of manure burns plants



production problems mostly related to disease and pests. Information on new varieties is passed down through the local input supplier who is buying from the large suppliers.

Technical improvements to cultural production practices and information and access to new varieties is difficult for small farmers. Farmers receive no government extension services, gaining most of their knowledge through practical experience or inherited from family members. Input suppliers do provide extension services, but only when the farmer has a pest, disease or nutrient problem. Similarly, they also recommend new varieties, but only those that are stocked by the company, bought in bulk from international seed suppliers.

HARVEST

The peak harvest season is between mid-June and end of July. Tomatoes are hand-harvested ripe every other day, in the early morning, packed and sent to the wholesale market. If tomatoes are sorted for size and quality at all, this happens during harvest. However, low quality production is usually not sorted. In large farms, harvesting is done by full-time (mostly Syrian) farm laborers, or supplemented by (mainly women) daily laborers, as needed. On smaller farms, family and/or daily laborers are used to harvest. Daily labors cost 2,000LL/hour.

POST-HARVEST

Normally, tomatoes are harvested in the morning and sent directly to the wholesale market. They are rarely left out in the sun for prolonged periods, as farmers need to get the product to the market as early as possible to receive the best price. Heat damage resulting in soft fruit can occur during transport as small farmers ship using pickup trucks with open beds. Transportation time to the main wholesale market, Ferzol, can take up to 1.5 hours. Cold storage or cooling rooms are not used for tomatoes.

Better quality tomatoes are packed in small crates, and placed in rows, while lower quality are thrown haphazardly into crates and sent to the wholesale market, resulting in bruised tomatoes that fetch lower prices, or are not sold. Crates are generally provided by the wholesale trader.

TRADE

Tomato prices are affected by quality, size and color of the fruit. Wholesalers, traders and exporters all prefer a medium-to-large size tomato with good red color (no green). The fruit should be ripe but hard, and not damaged.



Over 90% of the tomato trade for processing and fresh market goes through the wholesale market. Purchases from the wholesale market are not restricted to a type of commercial entity. Distributors, processors, supermarkets, small retailers, consumers, and exporters all buy directly from the wholesale market. Tomatoes are harvested in the morning and brought to the wholesale market by pickup trucks and cargo vans. Transport costs depend on quantity and location, ranging from 50,000LL for pickup trucks to 200,000LL for cargo vans. The price is determined daily by the traders and is the highest in the early morning, dropping as the day progresses. Wholesale markets sell most of the product by 11am and close by noon. Wholesale traders take 10% - 12% commission, and the farmers are paid weekly based on receipts.

Wholesale tomato prices rarely fall below 500LL/kg, however there have been instances oversupply has reduced farm gate prices to 300LL/kg. In general, greenhouse tomatoes receive better prices because of better quality and size in greenhouse production, averaging about 700LL – 800LL/kg during peak season. Prices rise to 1,000LL – 1,500LL for Grade A tomatoes, in early or late season.

Although greenhouse tomatoes receive a better price than open field tomatoes, exporters and high quality vegetable traders prefer open field Grade A tomatoes because of deep color, and better taste. Some Bekaa-based exporters buy only open field tomatoes for export to the Gulf. Grade A open field tomatoes are hard to find, with prices reaching 1,000LL – 1,750LL/kg throughout the season. Ammani tomatoes are the primary varietal used for processing or pickling, as a green tomato or used in pastes or for ketchup. Prices for processing tomatoes average between 400LL – 500 LL/kg.

Ferzol market is the main wholesale market for commercial trade in the Bekaa, and gives the best terms and prices for producers. The main motivation for farmers to sell to Ferzol is the high probability their product will be sold no matter what the quality. Ferzol has the largest number of buyers, and Ferzol traders are full-time professionals with contacts with larger wholesale markets in Beirut and Tripoli, where a farmer's product can be shipped if the product goes unsold in Ferzol. In this case, the farmer is responsible for the added transport expense and an additional 5% commission levied by the other wholesale traders, and incurs losses when the product is sold at lower prices in the cities.

Elsewhere within the Bekaa, the Baalbek wholesale market is mainly a market for household consumption, and traders do not have strong links with other larger markets. In addition, Baalbek market usually takes lower quality fruit commensurate with lower prices paid by consumers. Unsold product being thrown away at Baalbek was a common denominator for small producers.

Qab Elias has a large wholesale market that trades in vegetables that are produced in the area, such as eggplant, cauliflower, potatoes, and stone fruit. While tomatoes are sold there, most commercial buyers prefer Ferzol, which is about a 30-minute drive from Qab Elias.

Because the wholesale markets are open to all buyers, the distribution category of the tomato value chain is highly fragmented with all types of distribution from small local distributors for small shops and restaurants, large distributors for hotels, restaurants and supermarkets to integrated supermarket chains like Spinneys, Monoprix, TSC have their own distribution buying directly from the wholesale markets. Distributors buy daily from the wholesale market for delivery in the afternoon or evening and tomatoes are rarely stored. Hotels and restaurants are the largest buyers of cherry tomatoes.



98% of domestic production is sold and consumed in Lebanon, only about 5,000 tons⁵ is exported, mainly to the GCC. Exporters do not deal exclusively with tomatoes, rather they have mixed shipments of fruits and vegetables that leave to the GCC by plane or truck every day. With the Syrian crisis, plane shipments have increased, as transport to the GCC has gotten more restricted and expensive. The main tomato exporters are Lama Fruits in Tripoli, Mr. Ali Alam and Mr. Hussein Khashram both in Zahle, who source most of their product directly from the wholesale market buying through established relationship with a specific trader who knows the product quality that is desired. These exporters also source from certain large farmers.

Over 22,000 tons of tomatoes were imported in 2013, with 19,000 tons coming from Syria, and 3,000 from Jordan. Syrian and Jordanian tomatoes are alternatives to Lebanese production and compete directly with Lebanese production on price, although Syrian tomatoes are considered to be lower quality. Syrian imports of tomatoes have increased by 20% since 2011, as the Syrian war closed off access to domestic markets for Syrian farmers, while Jordanian imports were reduced by 50% due to transportation issues through Syria.

PROCESSING

Pastes and sauces make up about 90% of the tomatoes destined for processing with most of the supply is bought from the wholesale market. Tomatoes for processing are exclusively grown in the open field, and not in greenhouses.

No official data exists of the amount of tomatoes processed in the Bekaa, but interviews place it at around 10% – 20% of total tomato production, or 30,000 – 60,000 tons. There are some large SME producers such as Cedrus who have their own tomato farms, producing about 700 tons of paste annually. Others such as Dirani, provide inputs to growers and buyback about 1,000 tons of green Ammani tomatoes for pickling, although this arrangement is unique, as no other processors currently use contract farming as source of supply.

Co-operatives produce high-value processed products, but on a much smaller scale, taking less than 400 tons annually. Specialized high quality products include tomato jam and sun-dried tomatoes, which are produced by co-operatives such as Imm Touma in Aita Fakhar and Jana il Ayadi Cooperative Association in Deir Ahmar, respectively. Tomato Jam is a virtually unknown to household consumers, but is in high demand by restaurants that serve it as a side dish with cheeses. It is not found in supermarkets or retail shops, and is purchased from farmers markets such as Souk il Tayeb in Beirut.

The production of high-quality dehydrated products was limited, and solar drying equipment is not extensively used in Bekaa. However, there is significant interest from traders and exporters in sourcing high-quality sun-dried tomatoes, but who were constrained by consistency of quality and supply, as well as hygiene issues.

⁵ Trademap 2013



ENABLING ENVIRONMENT

KEY INPUTS AND MARKET SUPPORT SERVICES

Key inputs categories for the tomato value chain are agricultural equipment and other input suppliers, seed suppliers and nurseries.

Several input suppliers serving local farmers exist in the Bekaa. Many suppliers are agricultural engineers working as one-man operations, or large trusted farmers who have diversified into selling agricultural supplies. Smaller operations buy their seed, fertilizer and inputs from the two-major Bekaa input suppliers, Robinson Agri and Debanne, and resell these to farmers at a local level. In addition to selling greenhouses, the major input suppliers do sell seeds, fertilizers and pesticides directly to farmers, although smaller growers must travel to their stores in Ferzol or Zahle to arrange purchases, but their preference seems to be to sell to area input suppliers.

Several nurseries of varying quality exist in the Bekaa for seed germination. These nurseries work directly with the farmers or through the local input supplier, depending on the individual farmer, who must balance price versus the convenience of delivery or having to pick up the seedlings. Robinson Agri's branch in Jbeil and Mona Agri in Saida provide grafted seedling services to Bekaa farmers.

US Agriseeds is the only known international vegetable seed producer with test plots in the Bekaa. US Agriseeds's main products focus on new tomato, cucumber and pepper varieties, and sells throughout the MENA-region through major input seed suppliers. They generally do not sell directly to farmers. US Agriseeds is an excellent resource on the availability and trends of new varieties.

Drip irrigation is very popular in Lebanon, and a wide range of accessories, quality and specifications can be found throughout the Bekaa. There are domestically manufactured brands, by Panda Plast and Sodemco, although these are not cheaper than their Jordanian counterpart brands that have been in the market longer and are more trusted by farmers. Higher quality drip irrigation from Europe and the US is also available through larger input suppliers, but is significantly more expensive.

Jars and bottles for processed products are available locally through traders in Ferzol and Bar Elias, but the design and sizes are extremely limited as only one manufacturer, Soliver, exists in Lebanon.

ACCESS TO FINANCE

Due mainly to collateral requirements, small farmers generally do not take commercial loans, and self-finance their growing operations from past revenues or through credit given by input suppliers that are paid back at the end of the season. Although some microfinance programs targeting poor households, such as USAID-LIM or al Majmoua, do exist, no farmers interviewed had taken any assistance from these programs. However, Robison Agri and Debanne provide greenhouses on multi-year payback schedules to small farmers.

Credit sources to the processed food sector in Lebanon take mainly the form of loans in addition to leasing in



the case of financing of equipment. The Lebanese government has given the private sector little support to help them access the financial market. The two main supportive instruments available in Lebanon are: (1) a specific subsidy for interest payments made by qualifying enterprises and (2) the Kafalat loan guarantee program. The interest subsidy is provided through the Banque du Liban for loans granted by commercial banks to SMEs in the following sectors: industrial, agricultural, tourism, handicrafts, high technology and programming. The loan is used to finance a new project or expand an existing one. The loan amount varies between LL 50 million to 15 billion with a maximum duration of seven years and a grace period maximum of two years. By applying for an interest rate subsidy, the interest rate is reduced by seven percent on loans up to LL 5 billion and by 5 percent on the part ranging from LL 5 billion up to 15 billion.

Kafalat is a Lebanese financial company with a public concern that assists small and medium sized enterprises (SMEs) to access commercial bank funding. It guarantees up to 75 percent of the loan amount, based on business plans or feasibility studies that show the viability of the proposed business activity. It also guarantees up to 90 percent of the loan amount for startups. Kafalat targets SMEs and innovative startups that belong to one of the following economic sectors: industry, agriculture, tourism, traditional crafts, and high technology. Since Kafalat does not stipulate a minimum loan amount, the scheme could be accessible to clients whose needs are in the range of microfinance. A characteristic of the program suited to the needs of small businesses is the low reliance on collateral.

ACCESS TO TECHNICAL KNOWLEDGE

Traditional government extension services are very limited in Lebanon, and basically non-existent for small vegetable farmers. Small farmers receive limited extension services from input suppliers, although these are largely related to guidance on the application of fertilizers and pesticides to deal with pest, disease or nutrient issues. While input suppliers may suggest new varieties to plant and production improvement, small farmers usually only adopt those demonstrated by a trusted area farmer.

OTHER DEVELOPMENT ACTORS

Because of the Syrian crisis and refugee influx there are several development programs of various sizes throughout the Lebanese host communities. Most are focused on Syrian refugees, but there is a trend to move towards more livelihoods programming, albeit not necessarily in agricultural value chains.

There are two large projects currently working in agriculture in Lebanon: USAID-Funded Lebanese Industrial Value Chain Development (LIVCD) and the new European-funded Agriculture and Rural Development Program (ARDP).

LIVCD is working primarily on improving and promoting exports of agriculture products focusing on tree fruits, honey, grapes, olive, and processed products. They have a rural livelihoods component that is working in eggs and wild thyme, as well as providing marketing assistance for co-operatives. LIVCD is not working in vegetables or greenhouses.

ARDP is a European-funded initiative focused on strengthening extension-like government services within the agricultural sector, providing small farmers access to financing through ultra-low-interest Kafalat loans, and

improving agriculture infrastructure, especially water distribution networks. While focusing on infrastructure



rehabilitation, the priority for this project is to establish strong local groups and associations to better manage local resources such as water.



VALUE CHAIN ANALYSIS

DYNAMIC TRENDS

Widespread adoption of improved tomato varieties, although limited selection

Tomato growers in vulnerable communities have adequate access to a limited selection of improved tomato varieties. Small producers are generally limited to Vale and Jido for greenhouses, and Cristal and Ammani (Jordanian) varieties for open field farming. A smaller number of growers, specifically in Qaa, grew the Jordi and Jabali (*baladi*) varieties. Of all these, Vale and Ammani have the largest adoption with over 80% of growers interviewed using this variety depending on their production method.

No small farmers interviewed grew a cherry tomato variety, such as Suzanne. While cherry tomatoes command a relatively high farm-gate price (approximately 2,000LL/kg) they require more labor, and incur added packaging costs, making them suitable only to large farmers.

Critically, while the use of improved varieties is important for developing the Lebanese tomato sector, the limited selection makes it more difficult to stagger harvests, and results in an overabundance of high quality produce arriving at markets within a short period of time in June, July and part of August.

New varietal adoption is driven by input suppliers and/or by lead farmers in the area

Growing new varieties carries significant risks, especially for small producers. Such small producers do not actively seek out new varieties, and rely on input suppliers or larger farmers in their area for advice on what to grow. However, input suppliers do not necessarily keep up on new trends, and are more likely to offer whatever latest improved seed was imported in bulk.

If the small farmer were to try a new variety, it is not certain that he would receive a higher price due to lack of volume, and price visibility at wholesale markets. Large farmers have the luxury of land that allows them to experiment with new varieties, and produce in quantities that are attractive to wholesale traders, exporters and retailers. The large farmer is thus crucial to the adoption of new varieties than can extend the growing season, and offer consumers new choices.

Lack of adoption of low-cost technologies to improve yields and quality, vary harvest times and manage disease

Farmers do not use simple low-cost production and quality boosting and cost-saving methods in their current cultural practices. Poor pollination results in low yields, poor fruit set and misshapen fruit, which occurs when seeds do not develop uniformly throughout the fruit.

In greenhouses, plants are trained with string, and while some farmers prune, proper pollination practices are generally not used. At best, farmers tap the string for each plant in order to shake the blossoms. This is not an appropriate method for pollination, as the flower stem needs to be vibrated in order to release the pollen. In open fields this is usually accomplished by wind or the presence of bees, but in a closed greenhouse artificial pollination is needed using vibrating pollinating wands or bees.



None of the farmers interviewed support their fruit through stakes or trellis, instead letting tomato plants grow on the ground, folding them over each other as they grow. This causes higher incidence of loss from soil-borne disease and rot, making it more difficult to harvest efficiently, and decreases the quality of fruit by not circulating air or shading against direct sunlight.

Not one farmer interviewed has tested his soil for nutrient content or disease. Fertilizers are added based on input supplier instructions, but different production methods, soil types, and planting densities have various effects on nutrient uptake. Farmers might be adding unneeded fertilizers or pesticides, thus adding unnecessarily to their production costs.

Common practices such as testing soil for nutrient content and disease prevalence, staking open field tomatoes to boost quality and reduce disease, using pollinating wands to boost yield and vary harvest times, and the use of soil moisture monitors such as tensiometers are low-cost way to reduce production costs and increase farmer incomes.

Widespread adoption of drip irrigation and greenhouse production in the Bekaa, yet small farmers (under 6 dunums) in some of the most vulnerable communities still use flood irrigation, and are slow to adopt other technologies

While most small farmers (less than 6 dunums) interviewed in this study were using drip irrigation for either open field or greenhouse production, small farmers in marginal areas such as Qaa still rely on old canal systems and flood irrigation and lack new production technologies such as low tunnels or greenhouses.

Water costs, the desire to extend the growing season, flexible financing arrangements, and decreased infrastructure costs has increased adoption of drip irrigation systems and greenhouse production in many small farms. Drip irrigation systems are locally produced, easy to set up and use, and have a short payback period when factoring in fuel costs required for water pumping for flood irrigation.



Poor and infrequent tomato irrigation in Qaa

A basic greenhouse enables farmers to extend the growing season through the winter and costs on average \$2,000. Its current widespread adoption in the Bekaa is due to flexible financing arrangements given by input suppliers such as Robinson Agri and Debanne.

However, although payments are spread over multiple years, many farmers interviewed were not aware of interest accrued and the final cost of the greenhouse. Like greenhouses, low-tunnels protect against frost and allow for an earlier harvest, but the upfront capital, and added labor and irrigation costs, make it very difficult for some small holder farmers to justify their purchase.

Increased water pumping costs and concern on water availability

The availability of water has always been a concern in the Bekaa, especially with the rise of home construction and illegal wells. In 2014, the lack of winter precipitation and the increased demand due to the Syrian refugee crisis has caused the water table in the Bekaa to drop to unprecedented levels. Farmers have to pump for



more hours than in the past to get the same amount of water, increasing fuel costs for the same amount of land. Some have put in deeper wells requiring larger pumps. Municipalities such as Qab Elias provide irrigation water to farmers, and have instructed them to either limit their seasonal production, or plant less water-intensive crops.

Water storage in small farms is basic, consisting of a dugout pond partially lined with plastic, with no cover to prevent evaporation. Pumps are used to move water from the ponds to the irrigation lines. As noted above, other smallholder farmers rely on public distribution of water (such as those in Qaa using the antiquated canal systems) and thus have no water storage, which prohibits them from adopting drip irrigation.

Processed products generally limited to paste and sauces among co-operatives and SMEs

Tomatoes are relatively easy to process and package. Local processing co-operatives and SMEs have saturated the market with tomato pastes and sauces, along with several imported brands. One producer that was interviewed has a facility that produces over 700 tons of tomato sauce per year, much of which is still unsold. His break-even price for buying tomatoes is 400LL/kg—at the low-end of tomato farm gate prices. At this price, small farmers will not profit from linkages to processors. Any interventions in tomato processing should therefore focus on high-value specialized products other than pastes and sauces.

Increasing demand for high-quality organic dehydrated products among exporters and domestic distributors and retailers

Among the options identified for high-value specialized products, traders, distributors and retailers in Lebanon are all very interested in sourcing high quality, hygienically produced sun dried tomatoes. Sun-dried tomatoes (often preserved in olive oil) are popular in Mediterranean cooking. Currently, commercial volumes of sundried tomatoes are mainly imported from Europe in 0.2kg – 0.5 kg packages, or sold in bulk by large supermarket chains. Domestic production is of inconsistent quality and hygiene, as the solar dryers currently used in the Bekaa are rudimentary, without a hermitically sealed cover that keeps insects off the tomatoes.

Fairtrade Lebanon specifically is looking to source produce organic dried tomatoes from a co-operative. Fairtrade Lebanon works with organic farmers, and would ensure the supply of tomatoes to the co-operative for processing, once they were assured the end product was hygienic and adhered to their protocols of moisture content and packaging.

As mentioned above, tomato paste and sauce processors break-even price is about 400LL/kg, below the price that would incentive farmers to higher quality production. For this reason any intervention in the tomato value chain must target this high-end of the processing market.

Lack of product marketing

Lebanese fresh market tomatoes are not branded like in most other countries (e.g. origin stickers on individual fruits), and are impossible to trace back to the farm. Branding requires some product differentiation, and is difficult especially if farmers do not work together. In international markets, newer varieties are packed in .5 kg containers with attractive labeling. This is uncommon in Lebanon, and presents an opportunity if TOV

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⁶ Tomatoes-on-vine (TOV) are a variety of greenhouse-grown tomato that are rapidly gaining popularity in high-value



tomatoes are introduced to small farmers.

Further along the value chain, co-operatives and SMEs do an excellent job with recipes and production. The products are well received by consumers, and return rates for improper packing is relatively low, at around 10%. Many co-operatives have received support through various development projects in Lebanon, and therefore do not need production training or basic equipment. However, cooperatives and SMEs suffer from slow product sales due to a lack of marketing, poor labeling and branding, and generic non-differentiating packaging. This has motivated some cooperatives to shift to ad-hoc production for caterers or restaurants, but means lower employment and income for cooperatives that could otherwise further increase output.

markets. They are marketed in clusters of four to six tomatoes and are still attached to the vine.



OPPORTUNITIES

Promote and subsidize adoption of low-cost and/or improved production technologies, including low tunnels and greenhouses, for vulnerable farmers

High production costs, especially for water, fertilizers and pesticides, are the biggest constraint to improving small farmer income. Generally small farmers subsist from season to season, and do not have capital to spend on basic equipment or new inputs to improve yield and quality.

Soil tests are the single most important low-cost intervention provided to small farmers. Soil tests tell a farmer exactly what nutrients are required and by what amount and if the soil contains any pathogens such as nematodes. By testing soil every year, the grower can apply the correct amounts of fertilizers, or if needed pesticides, eliminating overuse. In addition, the farmer can grow the correct crops for the condition of the soil. These tests can be done at the Lebanese Agricultural Research Institute (LARI) in Fanar and Terbol, and cost about \$17 for the nutrients and \$25 for soil borne-diseases.

An opportunity also exists to distribute bamboo trellises or stakes for tomatoes that would keep plants off the ground, thereby reducing disease and rot, make harvesting easier, and prevent sun-scalding. Similarly, soil moisture monitors such as tensiometers cost about \$50 each and help the small farmer efficiently irrigate crops, potentially saving on water use. For greenhouse growers, vibrating pollinating wands have been proven to increase yields, fruit set and quality for tomatoes by 20% in other countries. They can help farmers vary harvest times by selectively pollinating plants.

Using low tunnels (*nafaqs*) to shorten growing times and protect plants from cold weather are a common method of production for larger farmers. However, their upfront costs (\$265/dunum and \$80/dunum for black nylon mulch), and higher labor requirements for installation, planting and maintenance, make them prohibitive for small farmers who might otherwise benefit from higher market prices reached at earlier harvest.

Greenhouses allow a farmer to plant earlier, extend production season and have higher yields per area than open field production. However, they have significant upfront capital and costs, as well as increased labor and maintenance costs. While most farmers would benefit from a greenhouse, the added costs should be carefully studied to determine if the farmer would benefit from this asset. Simply extending a growing season through the winter does not necessarily increase farmers' incomes, as there are significant technical requirements and added production costs, and no guaranteed sales channels for additional yield or guaranteed prices for higher quality. In the absence of providing extensive training to new farmers with no greenhouse experience, the preferred method for activities promoting greenhouse production is to provide assistance to those growers with previous experience with greenhouses

Promote production and marketing of higher-valued tomato varieties to farmer and marketer groups

Globally, Tomato-on-Vine (TOV) or cluster tomatoes are the highest-value commercial grown tomato category on the market (see text box). These tomatoes have a shorter growing season (80 days vs. 100), which could lengthen the harvest season and possibly give multiple seasons to certain farmers depending on the area.

Lebanon's neighbors including Jordan, Turkey and Israel grow TOV for domestic and international trade.



Within Lebanon, there are imported TOV varieties brought in from Holland, which retail for about 8,000LL/kg, but are not available in large quantities

Domestic-grown TOV are limited, but can be also found at Beirut-area retailers and supermarkets at a 75 - 100% price premium (3,000LL – 4,000LL/kg) to improved varieties. In the Bekaa, TOV are grown by just two producers: Hajj Kassam Younis in Brital and Eli Daher, a large processor and grower, in Zahle. After Internet research into new varieties to introduce to his greenhouse, Mr. Younis specially ordered 10,000 TOV seeds (Calypso variety) from Debbanne, a large input supplier. Separately, Mr. Daher was looking for the same variety after his own Internet research, and he contacted Debbanne, which bought 2,000 seeds back from Mr. Younis, and sold them to Mr. Daher.

Mr. Younis claims that the greenhouse production of this new variety (Calypso) was excellent, and he received between 1,500LL – 2,500LL/kg at the wholesale market, while Mr. Daher is planting in his greenhouses this season. The two growers see great potential with TOV, and are very interested in engaging additional small growers, and marketing their production.



TOV imported from Italy on sale in Beirut.

TOV have extra handling and packaging requirements in order to realize the highest value, and require an adjustment to common cultural practices. For example, farmers harvest single, ripe tomatoes every other day and send them to the wholesale market. TOV tomatoes grow on a cluster, and while they may not ripen all at once, keeping them on a vine allows them to continue the ripening process for up to 6 days. Appropriate information and training must be disseminated to farmers on harvesting procedures. At a minimum, cluster tomatoes should be carefully harvested with at least 4 to 6 tomatoes per vine cluster. An additional step of packing them into 500 gram bags with a producer label helps ensure that the clusters remain intact, and provides important marketing communication to the consumer.

There are at least three possible production models for introducing TOV production to vulnerable small farmers:

- i. Co-operative model: Hajj Kassim Younis is president of an agricultural co-operative in Brital with 14 members; he is a sophisticated lead farmer with greenhouse and open field production systems. Mr. Younis would like to increase production of TOV through the co-operative, with a marketing label, and is willing to allocate a greenhouse, provide training to his co-operative farmers, and invest in packaging and marketing TOV tomatoes with support from PPLL
- ii. SME forward-contracting model: Elie Daher, is a well-known fruit vegetable producer and processor based in Ferzol. He produced over 700 tons of tomato sauce last year, and has 70 greenhouses under vegetable production. He is constantly looking for new varieties and techniques to improve his business, and recently started growing cluster tomatoes. Mr. Daher has contacts with several small farmers throughout the Bekaa and has expressed the willingness to partner with the project to expand production into TOV by providing inputs to farmers and purchasing their production.



- iii. Community-based organization (CBO) marketing model: Qaa is at the top of the UNHCR's vulnerable community ranking, registering the highest quintile of poor Lebanese, and with a large population of Syrian refugees. Within Qaa, a dynamic and extremely active Greek Orthodox priest, Father Eliane Nasrallah, supports both the local community and refugee population with low cost health care, community center, education and irrigation for small farmers. Father Eliane is seen as a community leader and has the physical resources and ability to organize small farmers in the area. In addition, to space for a potential sorting and packing facility, Father Eliane can provide the project with a demonstration plot to train small farmers on appropriate production practices, and highlight TOV production. In addition, the Greek Orthodox Church can play a lead role with sorting and packaging facilities, and marketing of production from small farmers with unique branding.

Subsidize improved seedlings for vulnerable farmers

Interventions for the most vulnerable growers include distribution of improved varieties and grafted seedlings. Although there has been significant adoption of improved varieties in the Bekaa, small farmers in some vulnerable communities still do not have the means to purchase improved seeds. Farmers either reuse seed from the prior year or purchase unimproved varieties.

Improved seeds, such as Vale, can have resistance to certain diseases, provide better drought resiliency, and give higher yields (up to 25%) than the *Baladi* variety. Improved varieties are available through all input suppliers

Grafted seedlings, for greenhouses, are a fairly new concept in Lebanon but are quickly being adopted for their improved disease and drought resiliency, higher yields, and earlier harvest times. A farmer provides the seeds to a nursery to germinate, which are then transferred to a grafted seedlings producer like Robinson Agri or Mona Agri who graft the plant (scion) onto an improved rootstock. For example, tomatoes would be grafted onto an eggplant rootstock. Grafted seedlings cost about 20- 25% more than average seedlings, but can support incomes through savings in fertilizer and pesticides, as well as earlier harvesting times, which can boost farm gate prices by 25%.

Support use of environmentally sustainable and cost-saving technologies such a solar power pumps, improved small-scale water storage infrastructure, and bio-composting

Irrigation water comes from a farmer's private well, CBOs (i.e. Qaa) or from the municipality (i.e. Qab Elias). Fuel costs for irrigation are significant part of farmer's production costs, ranging from about \$20 to \$60/dunum every other day depending on crop and the depth of the well. The benefits of using solar power to replace these fuel costs are obvious to farmers, but many either cannot afford the upfront capital costs associated with solar installation, or simply do not know who to contact for more information. Subsidizing upfront costs on solar power installations to small farmers and CBOs will have an immediate and lasting impact on household incomes by reducing fuel costs. Larger installations to municipalities can save thousands of dollars in fuel costs, which can be used to improve other municipal services.

Additionally, while small, rudimentary water storage ponds exist throughout the Bekaa, poor water storage contributes to significant water loss either through evaporation and ground seepage. In Qaa, no small farmers have access to any form of water storage infrastructure, which prohibits them from using improved irrigation methods like drip irrigation. Improving water storage ponds with liners and covers to prevent seepage and

evaporation are important ways of conserving water and subsequently reducing water costs. Subsidizing water



storage for the most vulnerable farmers who are now limited to flood irrigation is a highly effective way of improving production and yields through the introduction of drip systems, fertigation and regular irrigation schedules.

Bio-composting, especially on small integrated farms, is an effective way to reduce production costs associated with fertilizers and reduce pesticide residues on crops. Generally, farmers realize the importance of animal manures to agriculture, but few know the proper composting methods, and or appropriate applications. Farmers could be trained on various techniques, including how to ensure the correct green/brown mix to ensure crops are not damaged, as well as the use of “composting tea” wherein liquid compost is applied to crops directly through drip irrigation lines. In addition, some small farmers lack the space for composting and manure storage. The opportunity exists to develop instructional composting plots for small farmer/herder communities either through renting small plots of land, or engaging a small lead farmer/herder with ample land.

[Subsidize specialized processing equipment and training, such as solar dryers, to established co-operatives](#)

Surprisingly, dried fruits and vegetables were lacking among product lines offered by co-operatives interviewed, even though there is substantial demand from traders and retailers like Fair Trade Lebanon. While there are a few co-operatives such as Jana Al Ayadi Cooperative Association in Deir Ahmar and Ain Al Louz cooperative in Ain Ata, there are concerns about the production methods especially related to hygiene.

Organic dried tomatoes are specifically sought by Fair Trade Lebanon, which sees a significant market for them both domestically and internationally. Fair Trade would provide the organic produce, and an organically certified co-operative would manufacture this product hygienically under their specifications. A potential partner is Nejmet el Soboh Cooperative in Rashaya, which is in the process of receiving organic certification, but does not yet have the training or equipment needed to produce dried tomatoes. Expanding the product line through a consistent buyer would enable the co-operative to hire more employees, (mostly women) or bring the existing part-time staff to full-time and increase purchases from farmers by creating a steady demand for tomatoes.

[Provide marketing services to co-operatives that produce high-quality, specialized products](#)

Since 2006, rural co-operatives have received significant training and assistance on food production from various donor projects in Lebanon. A select number of co-operatives produce exceptional products. However, many of these co-operatives are excellent producers but lack the marketing skills needed to expand their business beyond their current customer base. The opportunity exists for engaging a few exceptional co-operatives such as Linda El-Fayek in Rashaya to improve their packaging, marketing, and branding. Linda El-Fayek, is the president of the Rashaya Gardens co-operative, with 12 female members employing up to 21 during peak processing periods. Linda has several years of processing experience and is widely known for her jam and sauce processing expertise.



CONSTRAINTS

Small farmers lack technical knowledge of the application of low-cost improved production technologies

Knowledge of the low-cost practices considered above is unknown to most growers. In addition to rigorous training on staking tomatoes, incorporating soil moisture monitors, and the use of pollination tools, the benefits in adopting such new practices must be clearly demonstrated to farmers. This requires engaging farmers for the life of the project, and closely monitoring their activities.

For example, while the principles and benefits of composting are well known to farmers, little practical experience exists on the proper production and application of composts. Growers are unaware of how to handle and use the appropriate ratio of inputs, carbon-nitrogen balance, decomposition times, as well as effective use and application. Inappropriate application of compost can result in damaged plants, unrealized savings from purchasing less fertilizer, and the need for additional pesticides needed to kill resulting worms.

Limited seed selection, and production, and market experience of new tomato varieties

While there is wide-scale adoption of new tomato varieties in Lebanon, they are limited compared to other countries. It is difficult for a grower to find and try new varieties unless it is specially ordered through a major input supplier, and then they are restricted by a minimum order, usually 10,000 seeds planting 10 donums or greenhouses. Therefore, many new varieties that are popular throughout the world have not yet been grown and tested in Lebanon. This means, however, that the market for these new varieties is unknown, and significant production amounts at over 40 tons should be grown in order to gain interest for Ferzol traders, and/or to lock in exclusive relationships with large retailers.

Additionally, categories such as TOV require slight adjustments in current harvest practices. For example, the tomatoes should be picked as a cluster when all fruit is ripe, meaning that often, they would not be picked every other day as the grower would like. They also need to be packed carefully loose in cardboard boxes, or packaged in 0.5 kg containers.

Upfront capital costs for improved production technologies, especially solar-power technologies

Small farmers lack the upfront capital needed to invest in solar power technologies. In addition, farmers do not know the specifications required for their farm, have very little information on suppliers for this technology so therefore are wary of wasting money on substandard application.

Lack of guaranteed sales channels

Even with traditional or familiar varieties, increased yields and quality will not necessarily translate into higher income for farmers unless sales channels are established for their produce. Retail outlets buy ad-hoc from the wholesale markets on a daily basis and do not do contract farming. Therefore, a glut of supply, from unsold product, or temporary interruptions in market access would lower prices, or negate incomes entirely. Mitigating these potential effects requires focusing on the production of high quality products, appropriately packed and labeled.



Limited packaging options



An important part of marketing is the differentiating a product from competitors. Unfortunately in Lebanon, packaging for small producers is extremely limited both in design and volume. Bottles and jars come in the standard 250 ml, 350ml, 500ml, 1,000 ml size, in one shape with green or white lids, therefore providing few design options for producers to make their products stand out. This is compounded by generally poor label design or non-existent label design, and the lack of product promotion and marketing.



KEY RISKS

Lack of stakeholder buy-in, on improved production practices

Traditionally farmers are a difficult group to wean off traditional practices. Small vulnerable farmers also face higher opportunity costs in assuming the risks of new production. Therefore, farmers may not see the benefit of the additional labor or time required in implementing improved production methods, reverting back to traditional ways. Demonstration plots using local lead farmers to showcase improved methods of production or new varieties are good way to ensure that farmers receive the proper training, and adopt new production practices. A training schedule over the course of the season should be developed, and farmers should be required to attend before receiving any in-kind assistance.

Producers do not adapt appropriate cultural practices to new varieties

New tomato categories such as TOV are grown with many of the same production protocols as current varieties. However, there are important variations such as additional support in staking and/or trellising, harvesting less frequently, harvesting entire clusters of tomatoes rather than individually, as well as packaging and shipping methods to protect from damage. If these improved practices are followed, it is more likely for farmers to receive a higher price for their product.

Lack of adequate technical support can harm farmers' income through wasted production

If farmers are going to be introduced to improved production methods or new varieties, the appropriate amount of training and continued technical support should be given to ensure that new production is not lost, or target prices are not achieved. Encouraging farms to embrace new and unknown production techniques invites a certain (not insubstantial) amount of risk, and initial technical and financial support should be given to mitigate this risk to the farmer of being part of the program activity.

No price increases for new tomato varieties

Growing new varieties does not necessarily guarantee better prices for farmers. There are many factors affecting prices which are generally out of the farmers' control especially weather and conflict-related issues. Low production volumes and poorly marketed product reduce ability for farmers to negotiate better prices, even for high-quality produce.

Although some small farmers grow improved tomato varieties such as Vale and Ammani, their incentive to grow a high quality product is lower because of difficulties negotiating high prices with relatively low volume. Small farmers do not generally consolidate their production with others, preferring to sell directly to the wholesale markets several times per week during harvest season.

The break-even price for tomato paste and sauce processors is about 400LL/kg, below the price small farmers should receive as an incentive to invest in improved production.

Solar pumps could result in water overuse

The main factor for limiting water use is the price of diesel for the pumps. By removing this cost, farmers



and/or municipalities might be inclined to over-irrigate the fields, decimating the already overused water table. Careful planning and training must be given to beneficiaries to avoid this, along with the use of irrigation sensors.

Unavailable land for composting activities

Some farmers in vulnerable communities do not have land to dedicate to composting. While plots of land are available for composting, concerns and perceptions about manure storage and impact on public health could be an obstacle in finding an appropriate activity site.



TABLE: TRENDS, OPPORTUNITIES, CONSTRAINTS, RISKS

Trends	Opportunities	Constraints	Risks
Widespread adoption of improved tomato varieties, although limited selection	Promote and subsidize adoption of low-cost and/or improved production technologies, including low tunnels and greenhouses, for vulnerable farmers	Small farmers lack technical knowledge of the application of low-cost improved production technologies	Lack of stakeholder buy-in, on improved production practices
New varietal adoption is driven by input suppliers and/or by lead farmers in the area	Promote production and marketing of higher-valued tomato varieties to farmer and marketer groups	Limited seed selection, and production, and market experience of new tomato varieties	Producers do not adapt appropriate cultural practices to new varieties
Lack of adoption of low-cost technologies to improve yields and quality, vary harvest times and manage disease	Subsidize improved seedlings for vulnerable farmers	Upfront capital costs for improved production technologies, especially solar-power technologies	Lack of adequate technical support can harm farmers' income through wasted production
Widespread adoption of drip irrigation and greenhouse production in the Bekaa, yet small farmers still use flood irrigation	Support use of environmentally sustainable and cost-saving technologies such as solar power pumps, improved small-scale water storage infrastructure, and bio-composting	Lack of guaranteed sales channels	No price increases for new tomato varieties
Increased water pumping costs and concern on water availability	Subsidize specialized processing equipment and training, such as solar dryers, to established co-operatives	Limited packaging options	Solar pumps could result in water overuse
Processed products generally limited to paste and sauces among co-operatives and SMEs	Provide marketing services to co-operatives that produce high-quality, specialized products		Unavailable land for composting activities
Increasing demand for high-quality organic dehydrated products among exporters and domestic distributors and retailers			
Lack of product marketing			



ANNEX I : ORIGINAL VALUE CHAIN SELECTION MATRIX

Value Chains	Vulnerability & Beneficiary Profiles Criteria					Market Structure Criteria				PPLL Design Constraints Criteria					VC Upgrade Strategy Criteria					Score
	Existing/stable VC in vulnerable communities	Opportunity to benefit poor households	Potential to engage women	# small producers (< 2 ha.)	Potential to bundle / group producers	Current unmet demand	Potential sales to local market(s)	Activity across Bekaa	Potential for contract farming / private label	Length of growing (prod.) season	Potential for low-cost intervention(s)	Potential to bundle activities across VCS	Multiple activities possible within VC	Complementary linkages with other programs	High-value product	Potential for value-added products	Low input requirements	Low water requirements	Local availability of improved production methods	
Dairy (Small Ruminants)	High	High	High	High	High	High	High	High	High	High	High	Med	High	High	High	High	Low	High	Med	53
Cucumbers and gherkins	High	High	High	Med	High	Med	High	High	High	Med	High	High	Med	Med	Med	Med	Med	Med	High	48
Eggplant	High	High	High	Med	Med	Med	High	High	High	Med	High	High	High	Med	Med	Med	Med	Med	High	48
Tomato	High	High	Med	Med	Med	Med	High	High	Med	Med	High	High	High	Med	Med	Med	Med	Med	High	46
Honey	High	High	Med	Med	High	Med	High	Med	High	Med	High	Low	High	Low	High	Med	Med	High	Low	44
Chilies and peppers (capsicum)	High	High	Med	Med	Med	Med	High	Med	Med	Med	High	High	Med	Med	Med	Med	Med	Med	High	44
Eggs in shell	High	High	Med	Med	High	High	High	High	Low	High	High	Low	Med	Low	High	Low	Med	High	Med	44
Herbs and Spices	Med	High	High	Med	High	Med	Med	Med	High	Low	High	Med	Med	Low	High	High	Med	High	Low	43
Medicinal Herbs	Low	Med	High	Med	High	High	Med	Med	Med	Low	High	Med	High	Low	High	High	High	High	Low	43
Berries	Med	Med	High	Low	High	Med	Med	Low	High	Low	Med	Med	Med	Med	High	High	Med	Med	Med	40
Legumes	High	High	Med	Med	Med	Med	Med	High	Med	Med	Med	Med	Med	Low	Med	Med	Med	Med	Low	39
Pumpkins, Squash, and Zucchini	High	High	Med	Med	Med	Med	Med	Med	Med	Low	Med	Med	Med	Med	Med	Med	Med	Low	Med	38
Stone Fruits	High	Low	Med	High	Low	Med	High	High	Med	Low	Med	Med	Med	Low	Med	Med	Med	Med	Med	38
Pome Fruits	High	Low	Med	High	Low	Low	High	High	Med	Low	Med	Med	Med	Low	Med	Med	Med	Med	Med	37
Dairy (Cow)	Med	Low	Med	Low	Med	Med	High	Med	Med	High	Low	Low	Med	Med	High	High	Low	Low	Med	36
Live Poultry	High	Low	Low	Low	Med	Med	High	Med	Low	High	Low	Low	Low	Low	High	High	Med	High	Med	36
Fresh Grapes	High	Low	Low	Med	Low	Med	High	Med	Med	Low	Med	Low	Med	Low	Med	Med	Med	Med	Low	33
Watermelon & other melons	High	Med	Low	Med	Low	Med	Med	Med	Low	Low	Med	Low	Low	Low	Med	Low	Med	Med	Med	31
Olive Oil	Med	Low	Low	Low	Med	Low	Med	Med	Med	Low	Low	Low	Low	Low	Med	High	Low	High	Med	30
Nuts (Almonds, Walnuts, Chestnuts)	Med	Low	Low	Low	Med	Med	Med	Med	Low	Low	Low	Low	Low	Low	Med	High	Med	High	Low	30
Leafy Greens	Low	Low	Low	Low	Low	High	Low	Low	Low	Med	Med	Med	Med	Low	Med	Low	Med	Med	Med	29
Potatoes	High	Low	Low	Low	Low	Med	Med	Med	Low	Med	Med	Low	Low	Low	Low	Med	Med	Med	Low	29



Floriculture	Low	Low	Med	Low	Low	High	Low	Low	Med	High	Low	Low	Low	Low	High	Low	Low	Low	Low	27
Onions	High	Low	Low	Low	Low	Low	Med	Med	Low	Med	Med	Low	Low	Low	Low	Low	Med	Med	Low	27



ANNEX II : LIST OF INTERVIEWEES

Value Chain Interviewees

Interviewee Name	Location	Occupation
Hajj Fadi Lakkis	Baalbek	Small producer
Mr. Bassel Ismail	Brital	Small producer
Mr. Deeb Kaddour Kanjo	Brital	Small producer with livestock
Hajj Kassem Younes	Brital	Small producer
Hajj Abdullah	Qaa	Small Producer
Mr. Tony Bitar	Qaa	Small Producer
Mr. George Tohme	Qaa	Small Producer
Jocelyn Hourani Bou Chedid	Kherbet Qanafar	Small Producer
Mr. Gerges Abou Anna	Ain Ana	Small producer, processor, grocery owner
Mr. Issam Karam	Kherbet Anafar	Small producer with livestock
Hajj Kassem (Ibrahim Ali Younes)	Brital	Large producer with livestock
Mr. Mohamad Kurdi	Beirut, Chaat, Qaa	Large producer
Mr. Chafiq Maacaroun	Riyak	Large producer with livestock
Mr. Mohamad Abdallah	Sar'in	Large producer
Mr. Ali Karsifeh	Douris	Large producer, middle man for Mr. Dirani's processing company
Mr. Imad Ammourey	Ferzol Market	Wholesaler of fruits and vegetables
Mr. George Zaarour	Ferzol Market	Wholesaler of wild and rain-fed cucumbers
Mrs. Oumaya Zeidan	Ain Ata	Women Processing Coop
Mrs. Linda Fayek	Rashaya	Women Processing Coop
Mrs. Josephine Naim	Kherbet Qanafar	Women Processing Coop
Mr. Elie Daher	Ferzol	Processor
Mr. Bernard Mechaalany	Mreyjat	Processor
Mr. Nabil Kassatly	Taanayel	Processor
Mr. Samir Dirani	Ksarnaba	Processor
Mr. Philip Adaimy	Beirut	Marketing for Fair Trade Lebanon
Mr. Rami Obeid	Alma	Large producer/Exporter
Mr. Hussein Khashroum	Bar Elias	Cold Storage and Packing Houses; Exporter
Dr. Salwa Tohme Tawk	Beirut	AUB Extension Services
Dr. Shady Hamadeh	Beirut	AUB Extension Services
Mr. Michel Moukarzel	Riyak	Input Supplier
Ms. Sarah Ezzedine	Beirut	Seed Supplier
Mr. Wadih Khazzaka	Zahle	Input Supplier

Municipality Interviewees

Interviewee Name	Location	Occupation
Mr. Saadeddine Ibrahim Mayta	Bar Elias	Municipality head
Mr. Mohamad El Sarout	Bar Elias	Deputy municipal head
Mr. Fadi Shibli	Bar Elias	Municipal contracts manager
Mr. Nazem Youssef Saleh	Marj	Municipality head
Mr. Walid Abdullah Darwish	Marj	Deputy municipal head
Mr. Dergham Touma	Qab Elias	Deputy municipal head
Mr. Mohamad Abi Nassif	Qab Elias	Agricultural Development manager at the municipality