AMERICAN UNIVERSITY OF BEIRUT

PROFITABILITY OF ORGANIC FARMING IN LEBANON: THE CASE OF FRUIT VEGETABLES VALUE CHAIN

by
ANDREW EDGARD TRABOULSI

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Sciences
to the Department of Agriculture
of the Faculty of Agricultural and Food Sciences
at the American University of Beirut

Beirut, Lebanon
April 2019

AMERICAN UNIVERSITY OF BEIRUT

PROFITABILITY OF ORGANIC FARMING IN LEBANON: THE CASE OF FRUIT VEGETABLES VALUE CHAIN

by

ANDREW EDGARD TRABOULSI

Approved by:

Dr. Gumataw Abebe, Assistant Professor
Department of Agriculture Sciences — Advisor

Dr. Mirella Aoun, Visiting Assistant Professor
Department of Agriculture Sciences — Co-Advisor

Dr. Yusuf Abou Jawdah, Professor
Department of Agriculture Sciences — Member of Committee

Dr. Rami Zurayk, Professor, Chairperson
Department of Landscape Design & Ecosystem Management — Member of Committee

Date of thesis defense: April 18, 2019

AMERICAN UNIVERSITY OF BEIRUT

THESIS, DISSERTATION, PROJECT RELEASE FORM

Student Name: Traboulsi Andrew Edgard
Last First Middle

☑ Master's Thesis ○ Master's Project ○ Doctoral Dissertation

☑ I authorize the American University of Beirut to: (a) reproduce hard or electronic copies of my thesis, dissertation, or project; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes.

☐ I authorize the American University of Beirut, to: (a) reproduce hard or electronic copies of it; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes

After: **One ---- year from the date of submission of my thesis, dissertation, or project.**
Two ---- years from the date of submission of my thesis, dissertation, or project.
Three ---- years from the date of submission of my thesis, dissertation, or project.

Signature

Date: May 2, 2019

ACKNOWLEDGEMENTS

My recognition and gratitude are addressed to my advisor Dr. Gumataw Abebe, and my co-advisor Dr. Mirella Aoun for their continuous support, guidance, and expertise. I would also like to thank my committee members Dr. Yusuf Abou Jawdah and Dr. Rami Zurayk for their positive contribution and practical comments.

Special thanks are for Miss Salpy Naalbandian at the Science Library for her assistance with the bibliography and citations.

AN ABSTRACT OF THE THESIS FOR

Andrew Edgard Traboulsi for Master of Science
Major: Agricultural Economics

Title: Profitability of Organic Farming in Lebanon: The Case of Fruit Vegetables Value Chain

Although agriculture is the major contributor to the occupation of 75% of the world's poor, but with issues like food safety and sustainability rising, there is definitely a need for alternative farming system. This alternative system must tackle environmental, health, economic, and social concerns. These factors led this study towards organic agriculture, aiming to represent its' demographics in Lebanon. The foremost concern in this sector is that organic produce are not affordable for middle and low classes. A survey done in Beirut shows that 90% of the households prefer organic vegetables but cannot afford it. Demand for organic is increasing, but supply is still low. The objectives of this study is determining organic production costs, mapping the organic value chain, determining the profitability for farmers, and comparing with conventional sector for the same value chain. This helps in showing whether selling prices are justified by production costs.

Tomato was selected to be the main center of this study since it is the most common crop between organic vegetable farmers in Lebanon, and it is a cash crop with a very high demand in the market. Face to face interviews were executed after developing a questionnaire that permits the assessment of production costs, revenues, and profits. In addition, a market study (retailers, shops, and farmers market) was carried out in order to determine selling prices. A comparison between organic and conventional production costs and profits was done. It was found that organic tomato production costs are 11.60% higher than conventional. This is mainly due to higher labor costs, and the organic certification costs (especially for a small farm). Profitability differs based on the marketing channel choice. The more direct process of selling by the farmer to the consumers increases his profits.

It is concluded that organic farming can be profitable, and production costs are not the only factor behind the difference in selling prices. Farmers need technical assistance and marketing orientation to increase their efficiency and improve their profits. In addition, more organic markets should be made available, more subsidies should be provided for this sector, and new policies must be implemented in order to regulate the organic value chain.

CONTENTS

Appendix

ILLUSTRATIONS

Figure Page

Tables

Table Page

ABBREVIATIONS

IMC	Instituto Mediterraneo Di Certificazione
CCPB	Controllo e Certificazione Prodotti Biologici
IFOAM	International Federation of Organic Agriculture Movements
FAO	Food and Agriculture Organization
USDA	United States Department of Agriculture
GMO	Genetically Modified Organisms
N	Nitrogen
P	Phosphorus
K	Potassium
Ca	Calcium
Mg	Magnesium
Cu	Copper
RSP	Retail Shelf Price
CSA	Community-Supported Agriculture
LBP	Lebanese Pound
USD	United States Dollar

CHAPTER 1

INTRODUCTION

Agriculture remains the largest single contributor to the livelihood of 75% of the world's poor who live in rural areas (FAO, 2014, p.2). Based on the same report, the growth in agriculture can reduce poverty twice as much as the growth in any other sector can (p.3). This is a reason why agricultural growth must be encouraged in the process of reducing poverty. Moreover, organic agriculture is becoming one of the major topics in today's world. With issues like food security and food safety rising, the need for alternative farming systems is increasing. Organic farming is the most growing and innovative system in the 21st century (Crowder & Reganold, 2015, p.1). According to the Research Institute of Organic Agriculture (FiBL, 2018, para.11), "around 50.9 million hectares of agricultural land are organic (including conversion areas), 179 countries have data on organic agriculture, 1.1 percent of agricultural land is organic (although in 11 countries, 10 percent or more of the farmland is organic). About 2.4 million producers were reported; more than three quarters are in developing countries (Willer & Lernoud, 2017, p.4).

In 2015, Australia had the largest organic agricultural land (22.69 million hectares), then came Argentina (3.07), the United States of America (2.03), then Spain, China, Italy, France, Uruguay, India and Germany (all ranging between 1 and 2 million hectares). As a percentage of the highest shares of organic agricultural land, Liechtenstein

comes first (30.2%), then Austria (21.3%), and then Sweden (16.9%) (Willer & Lernoud, 2017, p.7).

The organic farmland and share is increasing year after year. Figure 1 is taken from statistics of the Research Institute of Organic Agriculture. It shows the increase in agricultural land dedicated to organic agriculture over a period of 15 years.

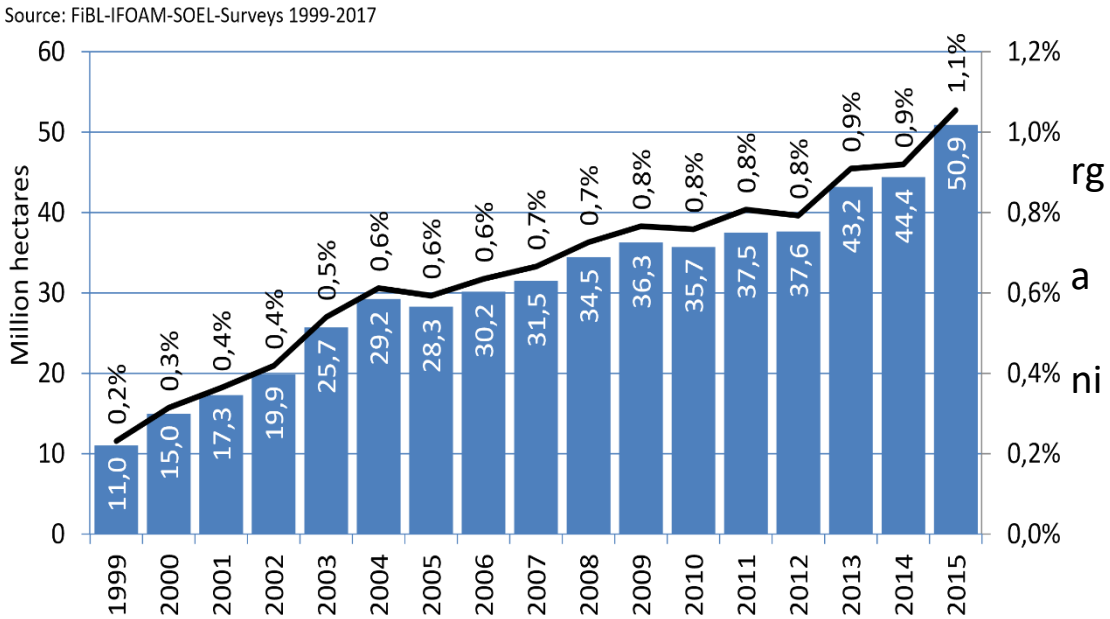

Figure 1.1 Growth of the organic agricultural land and organic share 1999-2015 (Willer & Lernoud, 2017, p.49)

This study is important because it tackles issues that concern the masses altogether. Organic agriculture is a sustainable system. In 2018, the Grace Communications Foundation, which is the publisher of the Sustainable table website, stated the following:

> "In simplest terms, sustainable agriculture is the production of food, fiber, or other plant or animal products using farming techniques that protect the environment, public health, human communities, and animal welfare. This form of agriculture enables us to produce healthful food without compromising future generations' ability to do the same" (para. 1).

Environmental problems are tragically noticeable, and chemical pesticides are one of the main factors leading to said problems. In addition to these causing environmental complications, they have a drastic effect on public health. It has become obvious that conventional farming is not considered the most sustainable practice, and with all these issues arising, people care about sustainability. Awareness is arising among the Lebanese people, and that is why organic agriculture can be a solution and an important farming system to consider. People with health problems, educated people, and those who can afford buying it, are willing to buy organic products (Sebaaly, 2012, p.7). Sustainability stands on three principles: environmental health, social equity, and economic profitability.

For organic agriculture to be a sustainable system, it needs to be profitable. Profitability in agriculture is a debatable issue. This is a worldwide problem, but the aim of this study is to depict its demographics in Lebanon. The majority of the public opinion

might say that working in the land probably might not be the most supportive job, as most people think that working in agriculture is for those who belong to the lower classes only, and is not a decent career. Anyone who gives the matter further studying, may find that agriculture can be the main source of living, and can help in providing a good well-being for those who work in it. Organic agriculture's appearance further contributed in the breeding of this new view towards the point at hand. Organic agriculture is the newest trend; it has harbored a fairly excellent reputation, and earned its points of respect. Furthermore, it has become conspicuous that organic agriculture can provide for a farmer and his family, and secure a living way above the average line of income. That is why "Profitability of Organic Farming in Lebanon" became the topic of this study. This subject is of further importance because organic agriculture in Lebanon is still considered feeble, and is not receiving the same attention as it should. Such dilemma is leaving the consumption of organic products only for people with high income, since the rest of the population is relatively incapable. Based on a survey done by an organic shop in Ashrafieh with 200 households in Beirut (Appendix 2), it was recorded that 90% of the participants prefer organic vegetables but cannot afford it due to expensive prices.

A meeting for the organic committee in the Lebanese Ministry of Agriculture was held on April 2018, and it raised some of the concerns around this issue. The topic of this meeting was the problem of supply and demand and high prices of organic product, and the mention of the awareness problem between farmers, since very few of them are taking the step to convert to organic farming. This study aims to add another milestone toward a better

future of organic agriculture in Lebanon by independently determining production costs and identifying the bottlenecks of profitability in the value chain studied.

Other reasons make this study interesting and beneficial to the public: health issues and problems are very serious. Cancer rates all over the world, and especially in Lebanon, are a true disaster. A direct reason for cancer is the quality of food consumed--including fruits and vegetables. There are low standards regarding pesticides residues in fruits and vegetables (Sebaaly, 2012, p.7). Another problem is that although the organic sector in Lebanon is growing year after year, it still has a long way to become solid (Sebaaly, 2012, p.4). An estimation of the market share of organic foods in the overall market is less than 1% (Rahhal, 2016, para. 6). This is due to the low supply and the increasing demand. Organic demand rates in Lebanon are increasing day by day, and the supply in comparison is still low. This situation explains why the pricing of organic products is soaring, since the number of producers is still considered low and high prices can be put up for the product. Lebanon lacks organic markets, except for Souk al Tayyeb, and these, if found, would regulate the prices and help people buy organic fruits and vegetables. According to Massoud from Biomass (a leading organic grower in Lebanon), as cited in Rahal (2016), Lebanon, high organic prices are due to two reasons: lower yields and multi-crop farms. Massoud believe that it would be fair to have a range of difference of 30%-70% between conventional and organic, knowing that it currently ranges between 50% and 300% (para. 3 in Rahal). According to (Sebaaly, 2012), the serious problem is that minimal data is available for organic production costs, nor in terms of import/export of organic produce (p.7). An additional factor is that Lebanon lacks national legislation. LibanCert used to be

the only national body that granted organic certifications for farmers (26% of certifications), while IMC, an Italian body, grants most of the certifications (74%) (Sebaaly, 2012, p.5). Today, the only certification body granting certifications for organic farmers is CCPB. Organic farmers and sellers say that high marketing prices are due to high production costs. But a literature review (cf. Chapter 2) does not always support this. Very few reliable articles state the different categories of production costs. For Lebanon, there is almost no publications that show organic production costs and its relation with the marketing price. People argue that organic selling prices should decrease, while farmers argue the opposite. This leaves us with some questions: Why organic products are so expensive? Is it due to high production costs? Or to other factors such as lack of legislation, lack of support and incentives…etc.

After stating the above facts, we are left with a dilemma: Organic products are in a high demand by the public due to environmental complications of the alternatives, the health issues they impose, and the increasing awareness tied to organic. Yet, organic products are expensive in the market beyond the reach of low and mid income households, and farmers are unable or unwilling to lower them (due to the cost of production and growth).

The purpose of this study is to determine with accuracy the production costs in organic farming in Lebanon and assess if it justifies the selling prices. In this way, solutions could then be shaped by the players of the sector. The objectives of this study are:

- A mapping of the organic tomato value chain,

- A determination of the profitability of organic farming for farmers,
- A cost-benefit analysis of value chain actors, and
- A comparison with conventional sector for the same value chain.

In order to attain these objectives, the following methodology was followed. The product was followed from the farm to the consumer, and all the actors of the value chain were interviewed. Then the data was analyzed and compared with similar data from the conventional sector. In following this methodology, the following research questions were tackled: What is the overall situation of the organic sector in Lebanon? Do organic farming production costs justify the marketing price? What other factors if any makes organic product in Lebanon highly expensive? Where to intervene in order to make organic products more accessible and consequently organic farming in Lebanon more competitive?

CHAPTER 2

LITERATURE REVIEW

2.1 Definitions:

In the following, some definitions that apply to the study context are provided.

- Based on IFOAM (2018), Organic Agriculture is defined as:

  "a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment, and promote fair relationships and a good quality of life for all [who is] involved" (para.1).

Simply, it is a system that does not depend on synthetic inputs (fertilizers, pesticides, seeds, additives…etc), but on sustainable management (FAO, 2018, para.1). In organic agriculture, natural fertilizers and pesticides are used (Vasile et al., 2015, p.258). According to Ontario Ministry of Agriculture (2018), organic production has some principles like protecting the environment, soil fertility, biological diversity, promoting health needs, and depending on renewable resources (para.1). Conversely, conventional agriculture is "capital-intensive, large-scale, highly mechanized agriculture with monocultures of crops and extensive use of artificial fertilizers, herbicides and pesticides, with intensive animal husbandry" (Beus and Dunlap, 1990, p.594).

- Conventional Agriculture is defined in the Monsanto study as follows:

> "The USDA describes conventional farming systems as conventional farming systems vary from farm to farm and from country to country. However, they share many characteristics: rapid technological innovation; large capital investments in order to apply production and management technology; large-scale farms; single crops/row crops grown continuously over many seasons; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers, and external energy inputs; high labor efficiency; and dependency on agribusiness" (Monsanto website, 2018, para.6).

Organic and conventional agriculture were defined solely since the comparison is between those 2 systems.

- Sustainability, according to the Investopedia (2018), is

"focusing on meeting the needs of the present without compromising the ability of future generations to meet their needs. The concept of sustainability is composed of three pillars: economic, environmental and social - also known informally as profits, planet and people" (para.1).

Sustainability is to keep something in existence, and to think on the long-term (Rigby and Caceres, 2001, p.22). Organic sustainability depends on many additional factors to the ones mentioned for sustainability. It focuses on "soil cultivation conditions, access to fresh water, topography, farming practices, and spraying" (Baker, 2015, p.2).

- Transition (conversion) period in organic agriculture is a period of time where the farmer should abide by specific procedures and constraints (Lamine and Bellon, 2008,

p.97). These transformations may take two or three years. It is the first few years of adjusting the farm (soil, weeds, insects…) and the farmer to organic practices; these years are the hardest (Ontario Ministry of Agriculture, 2018, para.8). Organic practices (soil quality enhancement, nutrient management, biodiversity…) must be applied in this period, and it takes this time to make sure this farm got totally out of the conventional practices (Lamine and Bellon, 2008, p.99). IFOAM showed the number of farms converting to organic in their transition period in the graph below (Fig 2.1):

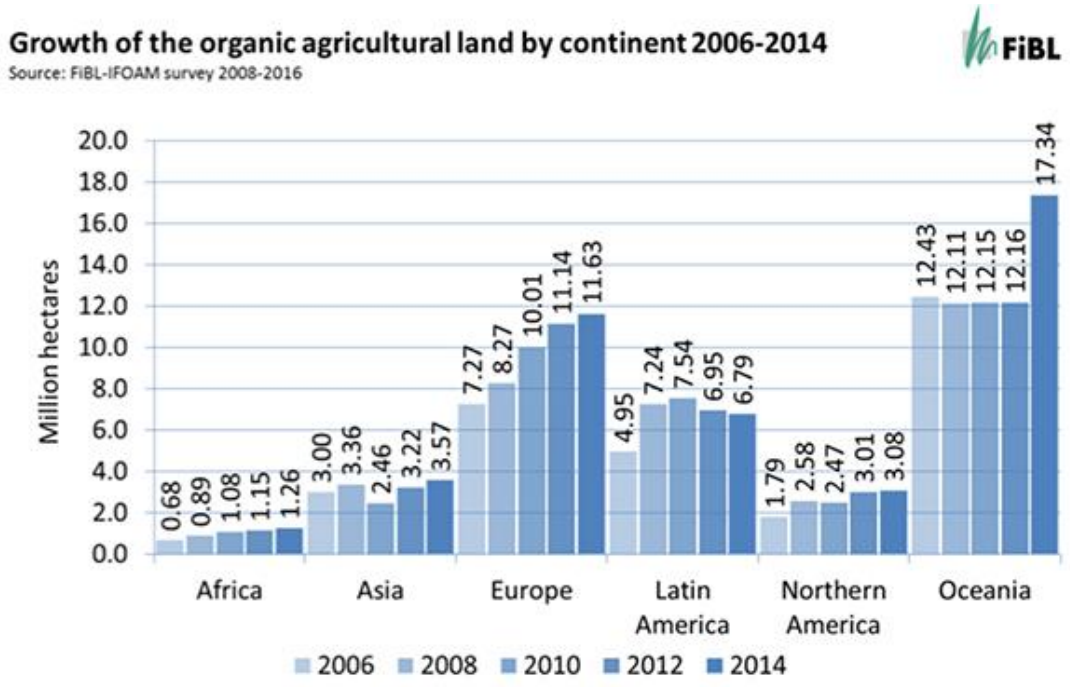

Figure 2.1 Growth of the organic agricultural land by continent 2006-2014 (IFOAM, 2018)

- Fruit Vegetables, botanically speaking, are vegetables that are considered fruits based on the Reuters report (Abadi, 2018, para.1). These may include: tomatoes, cucumbers, eggplant, peas…
- Organic Certification is technical standards or requirements of "production, storage, processing, handling, and marketing" (FAO, 2018, para.10) imposed by a certification body. Once this certification body makes sure these requirements are applied, then a label can be put on the product.
- Production Costs, based on (Investopedia, 2018) are the costs incurred by any business while "producing" or "manufacturing" their goods or services. It includes many sections under it; in our case these are: land rent, soil management, fuel, greenhouse maintenance (if available), fertilizers, pesticides, mulching, weeding, irrigation water, labor, transportation, organic certification (if available), and post-harvest costs. According to Merriam-Webster, another definition for production costs is "the combined total of raw material and direct labor costs and burden incurred in the production" (Merriam-Webster).
- Selling Price is defined by the "Market Business News" as the amount the customer pays for a product. Merriam-Webster dictionary states it simply as "the price for which something actually sells".
- Revenues are the amount of money a business earns during a specific period of time. It is the price of the product sold multiplied by the quantity sold (Investopedia, 2018). Revenues are "the total income produced by a given source" (Merriam-Webster).

2.2 Introducing Organic Agriculture:

Organic agriculture has shown a dramatic growth worldwide, (Lockeretz, 2007, p.1). It is affecting many developed and developing countries. “The number of organic farms worldwide has grown to an estimated 623,000, with some 50.9 million hectares managed organically (IFOAM Website, 2017)”. This number represents 0.7% of total agricultural land (Vasile et al., 2015, p.261), and is still small if compared to conventional farms, but is increasing. For example, organic sales in the United States of America increased by 53% in 3 years (between 2005 and 2008) (Post and Schahczenski, 2012, p.1). Several factors could be cited for the increasing trend of organic agriculture. According to Organic Power Foods (2017), conventional agriculture became just a business, without caring about providing safe, healthy, and tasty food to people (para.1). Food production and distribution is industrialized as the world population is expected to reach 9 billion by 2050 (Baker, 2015, p.3). As population increases, the demand for food will increase. Thus conventional agriculture and genetically modified organisms (GMOs) will continue to increase and remain strong (Baker, 2015, p.4).

To start introducing the literature’s point of view on organic farming, we need to state the potential advantages and disadvantages of organic farming at global and individual level. If we want to mention organic farming’s advantages, we should start with its global spread (Lockeretz, 2007, p.3). People over the globe became aware of it and are demanding to have organic products, especially organic fruits and vegetables. Other points based on Lockeretz (2007) are: organic activists knew how to defend their point of view, food safety

and health issues are now priorities, and organic agriculture is more appealing and the latest trend (p.4).

Organic agriculture increases food safety and raises income simultaneously. The rise of education and awareness in the late twentieth century helped in the development of organic agriculture (Rana and Paul, 2017, p.157). On the other hand, niche markets took place for organic products (Kristiansen and Reganold, 2006, p.421). These may be considered a strength since one would have loyal customers who will always buy, and may be a weakness since you can only target this niche market. According to Rana and Paul (2017), the excessive use of chemicals (pesticides and fertilizers) damaged the environment and made people eat products with no nutritional value (p.157). So, a key factor for the increased consumption for organic products is the consumers' attitude towards food safety. Rana and Paul (2017) stated:

> "Organic food encompasses natural food items which are free from artificial chemicals such as fertilizers, herbicides, pesticides, antibiotics, and genetically modified organisms. Additionally, organic food is not subjected to irradiation (Marwa and Scott, 2013). Thus, Organic food is considered healthy because synthetic chemicals are not used in its production (Suprapto and Wijaya, 2012). Literature shows that many terms are used to refer to organic food, such as "natural," "local," "fresh," and "pure" (Chan, 2001). Organic farming has always been a healthy option to produce followed by at least some farmers all over the world (Canavari and Olson, 2007)" (p.158).

The increase in demand of healthy food and sustainable practices is a significant boost in organic plea, as well as the existence of policies and reliable certification bodies in developed countries are also strengths (Vairo, Haring, Dabbert, & Zanoli, 2009, p.218). The presence of a certification body increased consumers' confidence in organic products (Buck et al, 1997, p.6). The nutritional benefit and taste is definitely an advantage for organic products (Marwa and Scott, 2013, para.23).

Of course, the development of organic agriculture has been constrained by several factors. According to Vairo et al. (2009), one of the main constraints is a weak and insufficient communication between the producers and consumers (p.219). Other constraints are: poor promotion and advertisement, the confusion of organic with terms like "eco" and "bio", the absence of organic agriculture in the education systems, the complex regulations and certification issues, and the lack of supports (*ibid.* p.219).

Organic agriculture provides many opportunities. It is growing market, this provides organic producers the opportunity to gain a larger share of the market (Marwa & Scott, 2013, para.21). Also, organic farming presented itself as an alternative system to the industrial farming and the high residue products (Kristiansen and Reganold, 2006, p.424). Based on Kristiansen and Reganold (2006), there are other opportunities like brand recognition, having higher standards (on animal welfare, for example), potential for rural development, and the economic performance that is "often equivalent to conventional farming" (p.424). Farmers have several factors that motivate them to grow organically. Based on Post and Schahczenski (2012), these factors are "environmental stewardship, lifestyle, family and personal health, as well as price premiums" (p.2). The consumers'

awareness may present an opportunity and a threat at the same time (Marwa and Scott, 2013, para.20). According to Marwa and Scott (2013), educated consumers, although they tend to buy organic products, are always more demanding, and seek higher standards and quality (para.20). They are hard to convince and unpredictable. Although this is a challenge, it is an opportunity to offer an alternative to these people.

Discussing the challenges, Kristianses and Reganold (2006) identified several factors: nature conservation, "equitable, affordable, and flexible access to certification services", educating labor, new inputs in the market such as GMO's, the weak basis for including/excluding materials from organic standards, the absence of international standards, research and development (R&D), "preserving food quality while trying to increase production", high prices to consumers, instability of supply, and maintaining professionalism (p.425). Another challenge is that in small countries, it is difficult for any farmer to really have fruits and vegetables with no pesticides residues, since even if they do not spray, they may have some residue from neighboring farms due to small areas (Organic Power Foods, 2017, para.6). Other challenges are having competitive production costs as compared to conventional farming, the supply-demand issue in order to maintain the high demand and keep producing enough organic products, organic markets, incentives and policies, competition of imports, and the fake organic products (Organic Power Foods, 2017, para.7-12).

2.3 Debate: Organic vs Conventional:

The debate between conventional and organic agriculture is a long story. In the 21st century,

productivity and efficiency are the main concepts in any production system (Beus and Dunlap, 1990, p.590). The current debate mainly focuses on the potential tradeoffs between food security and food safety. Conventional agriculture advocators argue that the world population is increasing rapidly, thus, we need effective ways in feeding them. While on the other hand, organic agriculture defenders say that we need to feed people safe and healthy food. The two views are reviewed next.

Organic agriculture advocators point out several practices against conventional farming such as the "groundwater contamination, soil erosion and degradation, chemical residues in food, and the demise of family farms and rural communities" (Beus and Dunlap, 1990, p.591). Their concerns arise from the perspective of protecting the environment from chemicals and profitability of organic farming (Ontario Ministry of Agriculture, 2018, para.3). For example, Post and Schahczenski (2012) showed the difference in prices between organic and conventional farming and the profitability of organic products (Fig 2.2).

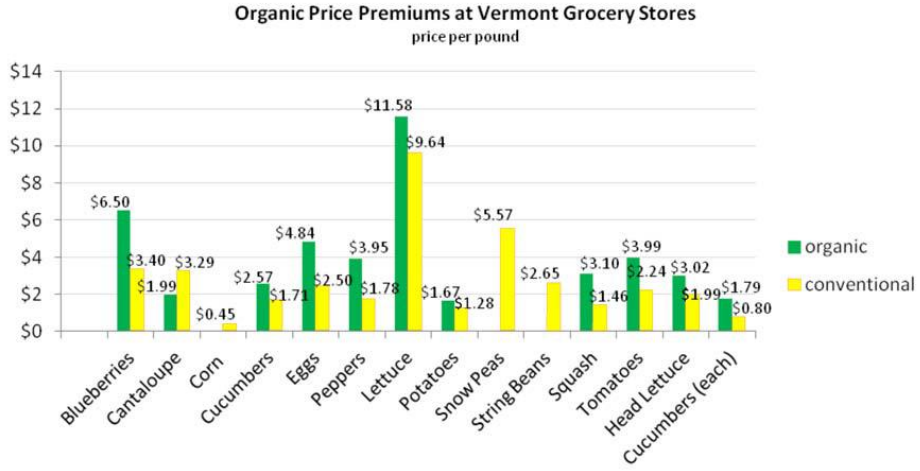

Figure 2.2 Organic Price Premiums at Vermont Grocery Stores

(Post and Schahczenski, 2012, p.4)

According to Post and Schahczenski (2012), “price premiums exist not only for organic versus nonorganic crops, but also arise from the venue where the product is sold: farmers markets, grocery stores, or wholesale to restaurants. For many producers, direct sales are best because the farmer receives the entire markup” (p.4).

The same authors also posed a question of whether “the price premium also covers the cost of certified organic products” or not. Figure 2.2 shows that, except for two crops, all had higher prices when organic.

According to the same study, the pricing strategy depends on calculating the costs and selling above them (p.7). It may also depend on the type of product, the quantity, and the debt capital. The authors mention that good record keeping can help in setting the perfect price (p. 7). If a farmer can know precisely how much s/he spends on labor, seeds, fertilizers, pesticides…etc, s/he can set a fair and profitable price. Other factors that affect pricing are: “harvesting costs, quality and selection of products, location and market, customers’ income/demographics, supply and demand in the area, market price in the area” ((Post and Schahczenski, 2012, p. 8). Organic prices are higher due to supply-demand issue: high demand and low supply (FAO, 2017, para.7). Also according to FAO, small volumes cost higher in marketing and distribution.

Another point in support of organic farming is that it conserves biodiversity while improving the farmer’s well-being. Organic farms contain more uncommon species (plant, insects, and nematodes), and diversity helps in disease resistance (Baker, 2015, p.12-14). Also, greenhouse gas emissions and energy use are higher in conventional farming due to high fertilizers and pesticides applications (ibid. pp.16, 21). FAO 2018 shows the aspects

where organic farming is more sustainable: soil, “structure, soil erosion control, increased biodiversity, crop rotations, minimum tillage, organic fertilizers”, water, “protecting groundwater from synthetic fertilizers and pesticides, enhancing water infiltration”, climate change, “reduced renewable energy use, better management for global warming through decreasing greenhouse gas emissions”, biodiversity, genetically modified organisms are also prohibited in organic farming (better for the environment and health) (para.6). For example, the excessive use of acidic mineral fertilizers causes damages in root growth, degradation of soil structure, and imbalanced soil minerals (Lockeretz, 2007, p.10). All these environmental issues matter a lot since there has been a booming environment movement that is growing day after day, and this has been a struggle between environmentalists and industrialists (Beus and Dunlap, 1990, p.592). For a farming system to be considered sustainable, it must stop the consequences of conventional agriculture, and must be socially acceptable (“government, community, and institutional support”), and this is the core of organic farming (Baker, 2015, p.29).

According to Krause & Spicka (2017), “organic farming is a system which takes a careful approach to the landscape, soil, animals, and plants” (p.1). Increasing consumer’s health awareness and consciousness also favor organic farming. (Chen, 2018, para.3). This explains the studies that showed that 60% of England’s population would buy organic products if it had the same price as those produced conventionally (Williams, 2002, p.19). According to William (2002), people want products with no chemical residues, and the majority knows that organic products are the solution (p.20). The same study shows how organic nutritional value is much better in terms of Vitamin C, nitrates, protein

quality…etc. “More than 90% of US corn depend on herbicides for weeds control, and atrazine (herbicide) is the most commonly found pesticide in streams and groundwater” (Pimentel et al., 2005, p.573).

Organic farming also improves working conditions. Buck et al. (1997) mentioned that laborers in an organic system are protected since they are not exposed to synthetic chemicals, and thus it helps in increasing employment (p.8). Organic farming proponents argue that the yield gap between organic and conventional farming is not a major problem in developed countries; a study by UC Berkeley showed that organic yields are lower by just 8% on average as compared to conventional yields (Kremen and Miles, 2012, p.16).

Indeed, many studies show that the difference in production costs between organic and conventional farming may be minimal (Post and Schahczenski, 2012, p.4). For example, the cost of chemicals (pesticides) is much lower in organic agriculture (Krause and Spicka, 2017, p.1), a point often highlighted to promote organic agriculture to “the public, scientists, and policy makers” (Lockeretz, 2007, p.3).

Vasile et al. (2015) tackled this debate objectively:

> “In literature, numerous studies have reviled the advantages of promoting organic agriculture in valuing the inland agricultural potential. As Pretty (1995), Singh (2000), Altieri (2002), Rasul and Thapa (2004), Bengtsson et al. (2005), and Eickhout et al. (2007) argue not only the most visible advantages of the organic agriculture could be highlighted: conserving soil and water resources, improving

soil and water quality, enhancing diversity, sustaining yield, producing quality products, natural pest control with less environmental pollution, but also numerous disadvantages: labour intensive, needs constant attention and skills, needs abundance of natural input material, and in transition periods (two years for arable crops) often yield reductions occur (Prasad, 2005). Debates organic vs. conventional are discussed in what follows.

Worldwide, organic versus conventional farming has generated great debates. On the one hand, Smil (2000) considers that intensive agriculture that utilizes large quantities of inputs in the form of fertilizers, pesticide, labor and capital made it possible to grow enough food to meet the current global needs. On the other hand, these practices made agriculture a major driver of land use change (Goldewijk and Ramankutty, 2004, UNEP, 2005), leading to environmental damage and degradation of several ecosystem services. The main goal expressed by United Nation is to meet the food demands of a growing population to achieve Millennium Development Goals (MDGs) by 2015 that include the eradication of hunger (UN, 2005) and yet maintain and enhance the productivity of agricultural systems (UN, 1992). It seems that food security and organic farming drive to totally different land uses: one is intensive and the other one is extensive (p.4)".

Advocates of conventional farming argue that organic agriculture has some problems like "nitrogen deficiency and weed competition" (Pimentel et al., 2005, p.580). In conventional agriculture, pest control can be managed more freely as compared to organic

farming. These people say that agricultural industrialization is the solution for food scarcity and food security (Beus and Dunlap, 1990, p.605).

Most of the studies show that organic farming yield is lower than the conventional produce. For example, "organic fruits and oilseed crops show a small difference compared to conventional (between 3% and 11% less yield), while organic cereals and vegetables have significantly lower yields than conventional crops (between 26% and 33%)" (Seufert et. al, 2012, p. 230). The percentage may differ between each type of crop, but the fact is that with this growing population, every additional yield is needed. They also say that organic farming has high costs, in manure and labor, for example (Krause and Spicka, 2017, p.1).

Many see that organic agriculture, without industrialization, cannot be a worldwide solution to the food crisis, while conventional farming produce greater amount of food and improve producers' market share (Baker, 2015, p.33). These people claim that organic agriculture poses a threat to many agribusiness industries (Beus and Dunlap, 1990, p.610). As for the labor, conventional agriculture gives labor the opportunity to work on large scale since conventional farms are larger, and the majority of farmers prefer working in large farms due to "higher pay, fewer demands, and fewer abuses" (Buck et. al, 1997, p.9). Some studies show that organic production costs are higher than conventional production costs (Post & Schahczenski, 2012, p.4). Table 2.1 shows a comparison between conventional and alternative systems (maybe organic or other systems).

Table 2.1 Conventional vs Alternative Agriculture

Conventional Agriculture	Alternative Agriculture
Centralization	**Decentralization**
National/international production, processing, and marketing	More local/regional production, processing, and marketing
Concentrated populations, fewer farmers	Dispersed populations, more farmers
Concentrated control of land, resources and capital	Dispersed control of land, resources and capital
Dependence	**Independence**
Large, capital-intensive production units and technology	Smaller, low-capital production units and technology
Heavy reliance on external sources of energy, inputs, and credit	Reduced reliance on external sources of energy, inputs, and credit
Consumerism and dependence on the market	More personal and community self-sufficiency
Primary emphasis on science, specialists and experts	Primary emphasis on personal knowledge, skills, and local wisdom
Competition	**Community**
Lack of cooperation, self-interest	Increased cooperation
Farm traditions and rural culture outdated	Preservation of farm traditions and rural culture
Small rural communities not necessary to agriculture	Small rural communities essential to agriculture
Farm work a drudgery; labor an input to be minimized	Farm work rewarding; labor an essential to be made meaningful
Farming is a business only	Farming is a way of life as well as a business
Primary emphasis on speed, quantity, and profit	Primary emphasis on permanence, quality, and beauty
Domination of nature	**Harmony with nature**
Humans are separate from and superior to nature	Humans are part of and subject to nature
Nature consists primarily of resources to be used	Nature is valued primarily for its own sake
Life-cycle incomplete; decay (recycling and wastes) neglected	Life-cycle complete; growth and decay balanced
Human-made systems imposed on nature	Natural ecosystems are imitated

Production maintained by agricultural chemicals	Production maintained by development of healthy soil
Highly processed, nutrient-fortified food	Minimally processed, naturally nutritious food
Specialization	**Diversity**
Narrow genetic base	Broad genetic base
Most plants grown in monocultures	More plants grown in polycultures
Single-cropping in succession	Multiple crops in complementary rotations
Separation of crops and livestock	Integration of crops and livestock
Standardized production systems	Locally adapted production systems

(Beus and Dunlap, 1990, p.598)

This table helps in understanding all the aspects of comparison between conventional agriculture and other alternative systems. The issue is not only on the economic or health scales, but on many others (centralization vs decentralization, dependence vs independence, specialization vs diversity). The debate can be narrowed down to the above six components (Beus and Dunlap, 1990, p.600).

2.4 Organic Agriculture in the 21st century:

Organic agriculture in the 21st century is the most growing sector in the food economy. Its market doubled between 2002 and 2007 (Baker, 2015, p.6). In the 21st century, younger generations tend to prefer organic farming since sustainability is the main concern and a trend. Organic farming systems encourage farmers to have crop

diversification. Buck et al. (1997) stated that based upon "California Certified Organic Farmers (CCOF) statistics, organic farmers grow between six and ten different crops on small area on average (p.7).

2.5 Production Costs Components:

Since this study focuses on the production costs of organic agriculture, it is essential to review the different components of production costs in the literature.

Creamer et al. (2001, p.566) stated detailed components of fertilizers and pesticides:

- Fertilizers: starter, nitrogen, phosphorous, potassium, and foliar.
- Pesticides: herbicides, fungicides, and insecticides.
- Custom application

Their study even goes into detail about specific herbicides, such as Trifluralin, and Sencor (metribuzin), fungicides, such as Kocide, and Bravo (chlorothalonil), and insecticides, such as Sevin, and *Bacillus thuringiensis* (-Bt). Other studies add different aspects to fertilizers and pesticides since production costs are much broader. Sgroi et al (2015) mention pruning management, organic certification, irrigation water, harvesting, and transportation (p.3). Land and labor are main factors in the production costs (Buck et al., 1997, pp.8-9). Organic farming depends highly on labor since mechanization is minimal in

organic system, especially in developing countries. Vasile et al. (2015) included economic factors in their study in order to see whether it is better for farmers to shift to organic or stay growing conventionally. These factors were "yields, input costs, and net returns" (p.259). They continued and tackled environmental factors that affect this choice: "nutrient loss, nutrient balance, water use, biocide index" (p.259). Krause and Spicka (2017) focused on sociological and demographic factors in their study, such as "age, education, [and] population of residence" (p.2). These factors also affect people's and farmer's choices towards organic. Marketing and distribution cannot be ignored in the production costs of organic farming (Buck et al., 1997, p.12). The location of the sales should come into question: is it direct purchasing (at farm gate)? Is it through retailers? Is it through some other shop (Buck et al., 1997, p.13-14)? Handling, labeling, processing, and transportation are additional factors that needs to be included according to the same study (p.12).

2.6 Sources of Data:

Torres et al. (2016) took information from two municipalities without conducting face to face interviews with farmers (para.2). Data was also gathered from world-wide reports from well-known institutions like the European Union, or from ministries of agriculture (Granatstein and Kirby, 2015, p.2). Some brought national experts in order to gather data from several countries, such as (Offermann & Nieberg, 2000, p.3). Most of the studies relied on primary data, as in interviews, surveys, and face-to-face questionnaires, such as Candela et al. (2015) and Berg et al. (2018). Other studies focused on secondary data as

well in order to be able to compare with data on conventional agriculture (Machek and Krause, 2017, p.4). Secondary data were based on private company's reports, ministry's reports, and many other data from organizations like FAO, for example.

2.7 Methods of Existing Studies:

The purpose of this section is to observe how these studies managed to calculate the production costs. Regarding materials and methods of these articles, most of them such as Paydar et al. (2015) and Berg et al. (2018) studied specific crops. Also, most of the articles conducted numerous surveys with many farmers in both organic and conventional in order to conceive an accurate result. The chosen farms were of different sizes (small, medium, large), so that the study would be representative (Berg et al., 2018, p.10). Some had a low number of questionnaires conduced (39 farmers) including both organic and conventional farmers (Berg et al., 2018, p.1), and some had huge number of farmers interviewed, where the information was gathered from 291 organic farmers and 4045 conventional farmers, for example (Machek and Krause, 2017, p.4). Their questionnaires were based on the components of production costs mentioned above. The questionnaires are not shown in all of the studies, but one can know the components included in them by studying the tables and graphs as in (Sgroi et al., 2015, p.3). In the study (ibid, 2015), the following was mentioned regarding materials and methods: "Materials and services include all costs of circulating capital (fertilizers, pesticides, herbicides, gasoline, irrigation water, labor, and other items)" (p.2).

2.8 Major Findings of Existing Studies:

After gathering the information, the following results were obtained. What was observed is that we cannot generalize and mention results that apply on all cases. But in most, the main conclusion is that organic yield is lower than the conventional (Seufert et. al, 2012, p.1).

For example, in Krause and Machek (2017) organic yields were around 41% of the conventional yields (p.2). In the years following the first couple of years, organic yield may become very close to conventional (Seufert et al., 2012, p.2). Some few studies like Berg et al. (2018) showed higher organic yields in some crops, and lower organic yields in other crops (p.4). Thus, the yield depends on the type of crop. Production costs may be higher for organic (Candela et al., 2015, p.4), except for two studies that were lower, as in Paydar et al. (2015, p.110). In general, organic production costs are high because of higher labor costs (Krause and Machek, 2017, p.2; Crowder and Reganold, 2015, p.2).

Table 2.2 shows us a comparison between both systems' production costs when growing oranges.

Table 2.2 Costs of growing oranges (Pta./Ha)

	Conventional Production	**Organic Production**
A. Variable costs of factors of production		
A.1. Raw materials		
A.1.1. Irrigation water	160 000	151 600
A.1.2. Fertilizers	74 846	165 000
A.1.3. Insecticides, fungicides, herbicides,...	135 440	12 883
A.1.4. Other inputs	8 000	8 000
A.2. Labour (includes irrigation, pruning, treatments, labour and machinery rental)	172 790	433 412
Total variable costs of factors of production	551 076	770 895
B. Interest on working capital (annual, taking into account duration of average period)	16 073	19 272
C. Fixed costs		
C.1. Amortization of planting	16 800	16 800
C.2. Interest on planting	10 500	10 500
C.3. Amortization of capital for equipment	60 000	60 000
C.4. Interest on capital for equipment	15 000	15 000
C.5. Costs of replacing trees and maintaining equipment	10 000	10 000
C.6. Income from land	80 000	80 000
C.7. Taxes and insurance	40 000	40 000
C.8. Certification		1 000
Total fixed costs	232 300	233 300
D. Total costs (2 + 3 + 4 + 5)	799 449	1 023 467

(FAO, 2018)

This table represents most of the studies' view regarding production costs (where the majority claims that organic production costs are higher). The issue is that by "how much" it is higher. Selling price for organic is much higher, thus, organic farming is more profitable (Candela et al., 2015, para.3). Dabbert (2000) mentions that organic and conventional production costs are almost the same, with a range of a plus or minus of 20% for either side (p.7). While on the contrary, Creamer et al (2001) mentioned that conventional tomatoes may sometimes appear larger and more appealing, thus, they can have higher prices (p.563). According to Torres et al. (2016), subsidies may play an important role in the financial analysis of organic agriculture, in addition to the availability of markets that also affects this issue (p.9). This statement is very broad. In some cases, organic production costs differ according to the cases at hand. Percentages differ between studies, and this is normal. Each study has its own conditions.

These differences are based on many factors which are the crop itself, crop requirements, farm size, farm location, labor training, and input prices in different countries.

Although we cannot make a general assumption from all studies; however, from the global report of Granatstein and Kirby (2015), we can make the following conclusions:

In general, organic fruits have lower yields, slightly higher production costs, but higher selling price. These higher prices lead to higher net returns with some exceptions in countless cases. With the rising research and development for the organic sector, production costs can decrease and yields can increase more (para.4).

2.9 Additional Conclusions from Existing Studies:

Briefly, organic agriculture in general is more profitable, and most importantly, more sustainable (Crowder and Reganold, 2015, p.4). Despite lower yields and the absence of premiums and support for organic agriculture, organic agriculture will remain spreading and booming (Crowder and Reganold, 2015, p.4). Vasile et al. (2015) stated the following:

> "organic brings higher returns than conventional, but when farmers decide how much of their land to convert to organic farming, they should answer the question whether they can sell the production, and to consider the market approach and its opportunity to sell" (p.265).

Rana and Paul (2017) tackle this issue of markets as follows: "many areas like distribution, marketing, ethical consumerism etc. for future research may be directly or indirectly helpful in developing the market and increasing the reach of organic food globally" (p.163). Packaging, policies by decision makers, and retailers' strategies are factors that encourage consumers to buy organic (Rana and Paul, 2017, p.163). Organic agriculture can be a technological alternative to conventional agriculture in terms of obtaining performance, and in ensuring food safety to population (Vasile et al., 2015, p.265). Public and government policies are needed in order to encourage conventional farmers to shift to organic, and continue supporting them especially in the transition period (Crowder and Reganold, 2015, p.4). As discussed in the previous section, we cannot

generalize and draw one conclusion regarding yield, profitability, and production costs, since it is factors and country dependent.

What is evident is that organic agriculture is a must and can be a solution for many problems. This issue is a matter of perception for farmers and consumers (Beus and Dunlap, 1990, p.610). Farmers need to set their priorities right; are they thinking economically, socially, environmentally, healthy? The issue is that organic may satisfy all these factors for farmers.

As for consumers, questions such as their willingness to pay more for healthy products, and to protect the environment arise. Most people say they are willing to pay, but the fact is that there is no good pricing strategy and policy to put a limit for organic pricing.

2.10 Gap in the Literature:

Facing this dilemma, it is obvious that almost none of the articles tackled the relation between production costs and marketing price. It is normal that organic products have higher prices than conventional, but the problem is where the limit lies. And even if organic products have higher prices, do they generate more profit? Studying profits need to take into consideration production costs along with selling prices. In addition, do we have policies that regulate and protect consumers from extremely high prices for organic products? Or policies that help increase the supply of organic products and competitiveness of organic farmers? Of course, all people would like to eat healthy products, but they should be able to afford it. The purpose of this study is to show whether the production costs justify the selling price of organic products in Lebanon or not.

CHAPTER 3

METHODOLOGY

In this section, the method regarding collecting data and analyzing it for the research questions and main hypothesis will be discussed. The topic stresses on the production costs of organic agriculture in Lebanon, and its' relation with the marketing price. As evident as it is, average households in Lebanon may not afford organic fruits and vegetables at all times. In order to study whether this high selling price is justified by the production costs, the following was done:

The organic committee in the Lebanese Ministry of Agriculture has showed its willingness to cooperate with the conductors of this study. They provided detailed information about organic farmers in Lebanon. Their list included: names, numbers, crops grown, farm location and size. Based on this information, it was possible to choose the specific crop that would be the main center of the study. Accordingly, it was decided tomato as it is the most common crop between all farmers (the only common crop between the 15 farmers interviewed in this study was tomato). Tomato is also a cash crop with high demand in the market. In the literature review section, it was apparent that most of the studies narrowed down their examinations on few crops in order to have accurate results. Other studies that gathered information about many crops couldn't draw reliable conclusions. In addition to that, it is crucial to choose different farm sizes so that the study would be representative. To have accurate results, this study did not focus only on big

farms and companies since it would have missed the numbers of medium and small farms which are somehow the majority.

3.1 Primary Data Collection (Survey):

In order to gather data, a survey (Appendix 1) was executed through face to face interviews with the farmers. As it is known, the number of organic farmers in Lebanon is low, thus the sample taken will be slightly deflated. The total number of certified organic farmers involved in vegetables production in Lebanon is 40 (from the Ministry's list of certified organic farmers in 2018). All of them were contacted in order to set an appointment for the survey, but the ones that responded positively were 15 (Note: out of the 40, three had wrong phone numbers, and seven of them did not grow tomatoes). Before conducting the interviews, a questionnaire was developed in a way that permits the assessment of production costs, revenues, and profits (appendix 1). This was approved by the IRB (Institutional Review Board) at the American University of Beirut. The point of inquiry was about all kinds of production costs: fixed costs, establishment costs and variable costs including labor and inputs. Current and recollection data over the last two years were sought. Also the questionnaire covers the yield and production, the marketing channels and selling prices, and the farmer's perception regarding organic agriculture in general.

Regarding the market price, a market study was carried out in order to determine the price of the agricultural product in the market. That's why, interviews were done with an organic shop in Beirut (appendix 2), and with an organic stand at Souk el Tayyeb, the

farmer market (appendix 3) in order to follow the different chains that the product takes from the farmer to the consumer. Then an estimation of average was drawn for production costs, yields and prices from all farmers interviewed.

3.2 Secondary Data:

Furthermore, data for the costs and profits in conventional management for tomato were acquired from the reference book (Production Costs of all Agricultural Products in Lebanon – in Arabic). It is extremely beneficial to hold a comparison between organic and conventional so that the difference in production costs may be apparent (the difference in selling price was obvious).

3.3 Data Analysis:

Considering the relatively small number of farmers who participated in this study, a direct and simple comparison between organic and conventional results was done along with a qualitative study, description, and analysis. The analysis method used is common among most of the articles reviewed followed the same method in analyzing data (comparison between conventional and organic systems). The gathered data aim to show whether the production costs justify the high selling price, and the difference between both systems (organic and conventional). The hypothesis tested in this study is whether production costs do (or do not) justify the marketing price.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Respondents' Background:

The questionnaire begins with personal information to identify what group of people organic agriculture attracts:

From the 15 participants, 13.33% were from age group 21-30, 20% from age group 31-40, 40% from age group 41-50, 20% from age group 51-60, and 6.67% from age group 61-70. Middle-aged people are more willing to adapt to new farming systems. Regarding their gender, 13 out of the 15 were males. Although females' percentage is low, but considering agriculture in rural areas, it turned out that women tend to engage in organic farming since it is rare to see women managing farms in rural areas. As for the respondents' education, 60% attained university degrees, while 20% graduated from secondary schools, 13.33% stopped at elementary education, and 6.67% refused to answer. Since 60% of the surveyed certified farmers are university graduates, this means that educated people are mostly the ones who are attracted to start an organic farm. Educated people seemed to be more aware of health, environmental, and sustainability issues. Table 4.1 summarizes the background information.

Table 4.1 Participants' Background Information

Age Group	Percentage	Gender	Percentage	Education	Percentage
21-30	13.33%	Females	13.33%	University	60%
31-40	20%	Males	86.67%	Secondary	20%
41-50	40%			Elementary	13.33%
51-60	20%			No Answer	6.67%
61-70	6.67%				

4.2 Transition Period and Certification:

CCPB ("Controllo e Certificazione Prodotti Biologici") was the only active certification body in Lebanon during the conduction of this study. All of the farms needed two to three years as a transition period before they were granted the certification (except for two farmers who initiated their farms as organic from the beginning). Most of the farms were certified after the year 2010 also except for two farms. This may speak in favor of the uprising trend in the last decade. The certification average cost is 600-650/year.

4.3 Information about the Farms:

The farms surveyed were dispersed along different regions in Lebanon: North Lebanon (Akkar, Zgharta, and Batroun), Mount Lebanon (Jbeil, Kesserwan, and Chouf), and Bekaa (Baalbeck and Zahle). The sample also represented farms of different surface area ranges:

Table 4.2 Sizes in dunums (~1000 sqm) of the Farms Surveyed in this Study

	Small Farms	Medium Farms	Large Farms
Number of Farms	2	12	1
Area Range	(0.22 to 4)	(12 to 40)	(130)

All these farms are certified organic vegetable farms. Although the main focus of this study is tomato, all of the farmers grow several organic vegetables (tomatoes, cucumbers, broccoli, lettuce, eggplants…). As for the record keeping, 13 out of the 15 participants kept records of their intervention on the farm. This helped in determining production costs.

Factors that motivated the transition to organic farming were: protecting the environment, preserving health (in few cases illness in the family which raised awareness), self-conviction, following the trend, high market demand, seeking higher profitability, and looking for positive contribution in the farming sector in Lebanon. Figure 4.1 shows the distribution of farmers on the different factors (multiple answers for each farmer).

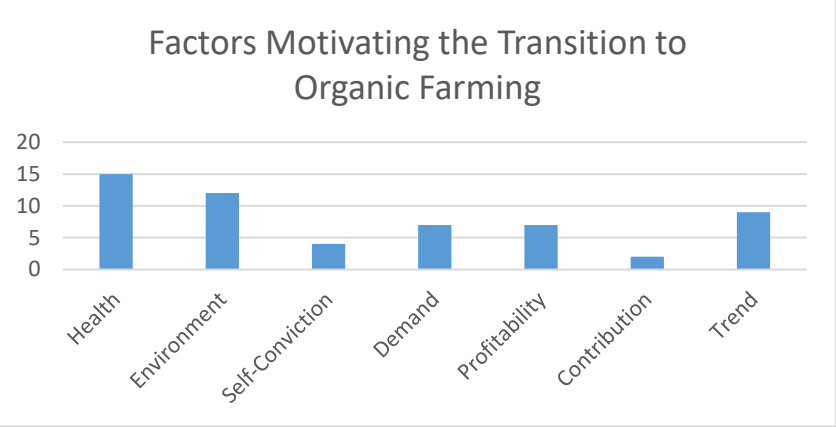

Figure 4.1 Factors Motivating the Transition to Organic Farming

Regarding whether the farm is the main source of their living, 53% answered negatively and mentioned that they depend on other sources for a living, while 47% depend mainly on their organic farm. This show that vegetable organic farming is still not enough to be the main source of living for all farmers.

4.4 Production Costs:

Based on the data collected from the questionnaire (Appendix 1) conducted with the farmers, an average was calculated regarding production costs:

Table 4.3 Organic Tomatoes Production Costs per dunum in Lebanon

Organic Tomatoes Production Costs per dunum	Amount in USD	Min	Max
Land Rent	400$	200$	650$
Land Preparation	40$	20$	67$
Seeds	450$	250$	720$
Greenhouses[1]	1,393$	1,000$	1,600$
Fertilizers[2]	550$	700$	320$
Herbicides	-	-	-
Fungicides	100$	70$	120$
Insecticides	96$	60$	200$
Mulching	100$	50$	150$

[1] 3 Greenhouses per dunum cost is 6000$. These are costs for 7 years. In order to get the cots/year: 75% of the greenhouse's cost; which is the structure; is prorated for 7 years, while 25% of its' cost; which is the polyethylene; is prorated for 2 years.
[2] Including composting

Water	200$	150$	300$
Labor	2,250$	1,600$	2,500$
Fuel	60$	10$	100$
Transportation	42$	34$	67$
Organic Certification/year[3]	25$	-	-
Total	**5,706$**		

- Seeds costs may range between a farmer and another. For a 1000 square meters (a dunum), around 2750 tomato plants are needed. Some (50%) buy hybrid seeds, while others (50%) depend on their "self-propagating cultivars".
- Fertilizers: All of the farms depend on manure (chicken or cow). Then the difference comes in the selection of N, P, K, Ca, Mg, and Cu.
- Fungicides: Mainly sulfur (all of the 15 farmers), and sometimes copper (five farmers).

Targeted pests: Powdery Mildew, Early Blight (*Alternaria solani*), Late Blight (*Phytophthora infestans*), Pythium damping off, Fusarium Wilt, and Grey Mold (*Botrytis cinerea*).

Sulfur spraying is the most common fungicide used by farmers, although some are searching for an alternative since sometimes sulfur is not being effective.

[3] Organic certification costs 650$. Total area for surveyed farms is 393 dunums. 650*15 = 9,750. Then to calculate the cost/dunum, 9,750/393 = 25$.

- Insecticides: Neem oil, *Bacillus*, and in few cases phyto soap.

Targeted pests: Aphids, *Tuta absoluta*, Lepidoptera, and Worms.

Usually, neem oil is distributed by the Ministry of Agriculture for free, but in some cases it has to be bought. That is why it is included in the costs of insecticides.

- Labor: The hourly rate of the labor is almost the same all over Lebanon, and also between conventional and organic farming. The rate is 2$/hour or 15$/day for the worker. 11 farmers pay it on a daily basis and 4 farmers on a monthly basis. 1 Dunum of organic tomatoes usually needs 2-3 full-time workers during the season. As for the labor time per practice, usually all the workers on the farm (usually three per dunum) are involved in all the activities mentioned below. The following was recorded:

Table 4.4 Labor Time per Practice per dunum

Activity	% of Total Time
Land Preparation	19%
Composting	5%
Sowing/Transplanting	17%
Pruning	5%
Fertilizing/Spraying	22%
Harvesting	32%

Harvesting is the most time-consuming activity in organic agriculture. This was expected since harvesting is an ongoing activity requiring several harvests in the season, and this is the same in both farming systems. Spraying is also time-consuming, but is less than in conventional agriculture since organic is less dependent on pesticides (for example, manual weeding is performed in organic farming instead of herbicides use).

Comparison between Organic and Conventional Production Costs:

A direct comparison was done between the production costs of both systems. Organic production costs were retrieved from the respondents' information, while conventional production costs were attained from the data published in "Production Costs of all Agricultural Products in Lebanon". Table 4.5 shows both production costs in USD.

Table 4.5 Comparison between Organic and Conventional Production Costs per dunum

	Organic Production Costs (average)	Conventional Production Costs (average)
Land Rent	400$	400$
Land Preparation	40$	70$
Seeds	450$	400$

Fertilizers	550$	450$
Pest Control	196$	250$
Water	200$	170$
Labor	2,250$	1800$
Greenhouses	1,393$	1,393$
Certification	25$	-
Total	**5,504$**[4]	**4,933$**

Organic production costs are 11.60% higher than conventional production costs. Although conventional farming requires more spraying in tomato growing which explains the higher pesticides costs for conventional, but organic production costs are higher for the following reasons: first, labor costs are a bit higher in organic, but most importantly, the organic certification is the major difference between both systems. Although it is shown that certification cost is 25$/du, but a farmer that has only 1 dunum pays 650$ on the certification (in above tables, it is an average for total surveyed farms area. In addition, composting is measured with the fertilizers section in table 4.5 (applicable in organic

[4] Total cost is different than total cost in Table 4.2. since here only the costs that serve for comparison are shown.

farming). As for weeding, in organic farming it is under labor costs (manual), while for conventional it is calculated in pest control costs due to the use of herbicides.

4.5 Yield and Marketing Channel:

In 1 dunum, 2750-3000 tomato plants are grown. On average, one dunum of organic tomato field yields 6000 Kg of tomatoes.

Table 4.6 Yield per dunum

	Organic Farming	Conventional Farming
Average Yield (in tons)	6	16

More than 50% of the farmers sell 70% of their yield to a distribution company and have no market access. This company has a well-established market coverage and is dominating the organic sector in Lebanon. The rest of the farmers either sell their produce at farm gate, or at Souk el Tayyeb, or directly to an organic shop. As for the losses, farmers incur losses around 25% (15% due to pests, and 10% due to returned produce).

4.6 Profitability throughout the Chain:

The profitability or the revenues out of organic farming differ based on the marketing channel choice. The following are different channels:

- *Channel 1*: The farmer sells to the distribution company, and this company sells by itself the produce to organic shops or retailers. In this case, the company buys organic tomatoes from the farmer at a price of 0.83-1$/kg (1250-1500 LBP), and then sells it to the shop or retailer for 2.5$/kg (3750 LBP), and the RSP (Retail Shelf Price) is 3.5-4$/kg (5000-6000 LBP). So the main profit goes to the distribution company in this case. Ten farmers followed this channel (eight of them follow a mix between channel 1 and 3).
- *Channel 2*: The farmer sells directly to the organic shop. In this case, the farmer's profit is better than in scenario 1. The farmer's selling price to the shop is between 1.66-2$/kg (2500-3000 LBP). Then the organic shop or retailer's RSP is 3.33$/kg (5000 LBP). In this case, the profits are divided between the farmer and the shop. Three farmers followed this channel.
- *Channel 3*: The farmer sells his produce by himself (either at Souk el Tayyeb or at farm gate). This is the best scenario (profit-wise) for the farmer. Usually, the farmer's price is 2.67$/kg (4000 LBP). Although this scenario provides the farmer with the best profit compared to others, but it also has its risks. The farmer may not be able to sell all his yield since Souk el Tayyeb is not always available, and is far from most of the rural farms. At the same time, accessibility to the farm may be difficult for consumers. Three farmers followed this channel.

Figure 4.2 shows the different channels:

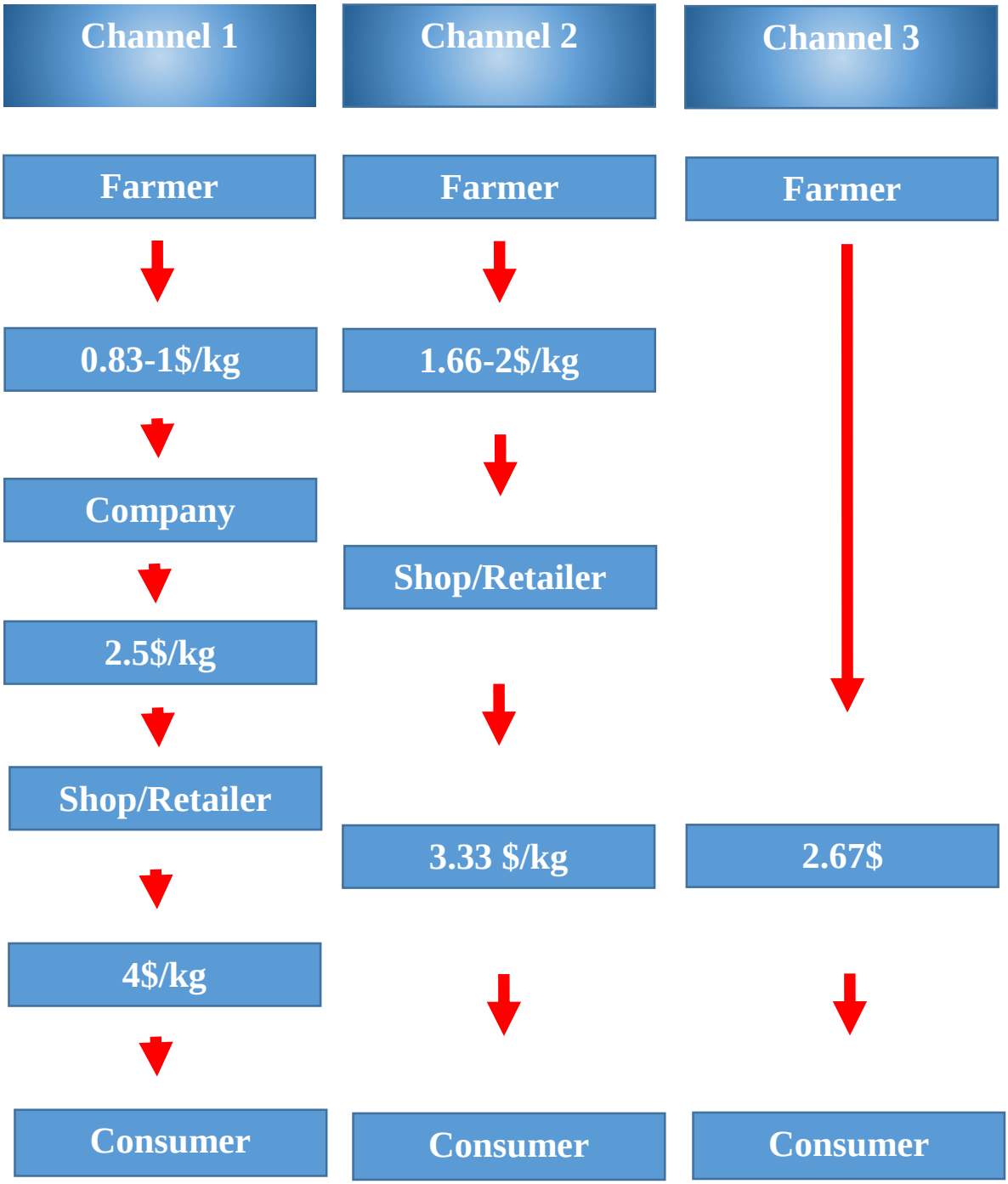

Figure 4.2 Marketing Channels

4.7 Farmer's Profitability:

After collecting the results of the production costs, yield, losses, and selling prices, the profitability of organic tomatoes is calculated. The most representative channel based on the results is a mixture between channel 1 and 3 (70% to the distributor, and 30% directly to consumers). So profitability will be calculated based on this formula (70-30).

Table 4.7 Profitability Comparison

	Average Yield (in kg)	Losses (in kg)	Yield After Losses (in kg)	Total Revenues (USD)	Production Costs	Profits per dunum (USD)
Organic	6,000	1,500	4,500	6,754$[5]	5,504$[6]	**1,250$**
Conventional	16,000	2,000	14,000	6,300$[7]	4,933$	**1,367$**

The profitability of organic tomatoes is almost the same as for conventional ones (117$ less). The higher yield in conventional is covered by the higher prices in organic. Organic can be more profitable if farmers sell their produce directly to the consumers (Channel 3).

[5] 70% of yield for distribution company with 1$/kg as selling price: 3,150kg*1$= 3,150$
30% of yield for direct sale to consumers with 2.67$ as selling price: 1,350kg*2.67$= 3,604$
[6] From Table 4.5
[7] Average price/kg for conventional wholesaler is 0.45$.

4.8 Comparison with Another Crop Grown Organically:

In order to set a benchmark, and know where organic tomatoes stand with respect to other organic vegetables in term of profitability for the farmer, data was collected from two farmers who grew organic broccoli, a trending cash crop for organic producers. The question asked was whether other crop such as broccoli would be more profitable as an alternative to tomato in organic farming?

Organic broccoli's production costs are less than organic tomatoes production costs by 12%. Although production costs are less, but organic broccoli's yields are much lower than organic tomatoes, where 1 dunum of organic broccoli yields 2400 kg (6000kg for tomatoes). Farmers prefer to have more tomato production than broccoli since demand for tomatoes is higher, and this is confirmed by stand farmers at Souk el Tayyeb (Appendix 3). The main advantage for broccoli is the high selling price (may reach twice tomato's selling price). As a result, tomato is among the top crops in demand and yield, but some crops like broccoli can provide an alternative in profitability due to high prices.

Table 4.8 shows broccoli's production costs. Diversification in organic farming is a major principle. Farmers must study carefully the choice of crops grown in their farm based on the market demand, profitability, and splitting the risk.

Table 4.8 Organic Broccoli Production Costs per dunum in Lebanon

Organic Broccoli Production Costs	Amount in USD
Land Rent	400$
Land Preparation	40$
Seeds	90$
Greenhouses	1,393$
Fertilizers	270$
Herbicides	-
Fungicides	-
Insecticides	96$
Mulching	100$
Water	200$
Labor	2,250$
Fuel and Lubricants	60$
Transportation	42$
Organic Certification/year	25$
Total	**4,966$**

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Considering all the aforementioned results and in order to answer our research questions, it is figured that production costs do not justify the high marketing prices. It is conclusive to say that organic agriculture can indeed be profitable. Awareness and concern about health and the environment are hefty contributing factors. Definitely, organic yields are low in comparison with conventional yields in the context of this study, but the difference is well covered with the high selling prices. The issue for organic farmers in Lebanon remains within the fact that they are not the ones benefitting from these high prices, but the "middle men" (distributors) are controlling the sector in Lebanon. This observable fact is somewhat strange to organic approaches around the world that favors very short circuits (i.e. farmers' markets, CSA, shares etc.) but rather a very conventional approach. Production costs are not the only factor behind this difference in selling prices and do far from justifying them, as there are different factors that play a role in these high prices, some of which are the better perception of organic produce, also organic yield being less by 60% (6 tons/du vs 16 tons/du), and the higher risk in organic farming (less spraying). These factors are farmer-related, while the major factor remains distributor-related when one considers the value chain as a whole. The distribution companies ("middle-man") controls the prices in the organic shops and retailers and make most of the

profit with their overhead. To a lesser extent, the retailer's overhead and profits and product losses play a role in the pricing strategy.

A last question remains unanswered as to where to intervene in order to make organic products more accessible and consequently organic farming in Lebanon more competitive? Serious and effective steps must be applied in order to meet the consumer's high demand for organic products, but at the same time low to middle class's inability to afford it.

First, considering the very low yield made by organic farmers, the latter need technical assistance and trainings to increase their efficiency in organic farming. The Ministry of Agriculture, along with universities must take more initiatives in entailing training sessions to organic farmers. Diversification is a must in organic farming, environmentally first and economically for farmers. Risk is divided and reduced in diversification, and profits increase too. Also, organic farmers must be oriented towards a solid marketing strategy, where no company or shop can control their sales and prices (Rana and Paul, 2017, p.8). They should improve the communication between them and the consumers by the means of new tools like social media or mobile apps. This can benefit both the farmers and the consumers. For consumers, trust will increase (direct contact with the farm), and prices are more reasonable due to the direct chain between them and the farmer. At the same time, even if prices are somehow lower, farmers' profits will increase since there is no profit allocation for a long chain. In addition, organic farmers can assemble a collective group or association to increase their power of selling and supplying the demand.

In addition, more organic markets should be made available, especially in rural areas (Willer and Lernoud, 2017, p.37). The farmers' market 'Souk el Tayyeb' in Beirut is a great initiative that helps farmers sell their organic produce, but the Lebanese organic market and sector needs more markets in different regions in a way that helps more farmers to have access to such markets. Also the Ministry of Agriculture, as mentioned in Urfi et al. (2011) should continue in subsidizing some costs for farmers (like Neem oil), but must invest in more subsidies to improve the sector (p.9). In this way, organic farmers are encouraged to continue farming organically, and more farmers are motivated to shift to organic. Finally, the ministry is required to implement policies that would address price controls, commission, and profit margin in a way that satisfies all players (farmers, middle men, shops, retailers, and consumers). Price controls must not affect farmers because their profits are not higher than conventional farmers as shown in this study (Table 4.8). To solve the unaffordable prices, distribution companies and retailers/shops must limit their margin in a way that makes organic produce affordable for all classes.

Organic agriculture is a national and a global need, and Lebanon must work on improving the weaknesses, and on taking advantage of the opportunity at hand.

REFERENCES

Abadi, M. (2018, June 24). 14 vegetables that are actually fruits. Retrieved from https://www.businessinsider.com/fruits-and-vegetables-difference-2018-6

Agriculture and poverty reduction. (n.d.). Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/0,,contentMDK:21501332~pagePK:478093~piPK:477627~theSitePK:477624,00.html

Baker, K. (2015). *The truth about organic: Sustainability, practice, and perception* (master's thesis). University of Colorado, Boulder. Retrieved from https://scholar.colorado.edu/honr_theses/826

Bellon, S., & Lamine, C. (2009). Conversion to organic farming: A multidimensional research object at the crossroads of agricultural and social sciences - a review. *Sustainable Agriculture,* 653-672. doi:10.1007/978-90-481-2666-8_40

Berg, H., Maneas, G., & Engström, A. S. (2018). A comparison between organic and conventional olive farming in Messenia, Greece. *Horticulturae, 4*(3), 15. doi:10.3390/horticulturae4030015

Beus, C. E., & Dunlap, R. E. (1990). Conventional versus alternative agriculture: The paradigmatic roots of the debate. *Rural Sociology*, *55*(4), 590-616. doi: 10.1111/j.1549-0831.1990.tb00699.x

Buck, D., Getz, C., & Guthman, J. (1997). From farm to table: The organic vegetable commodity chain of Northern California. *Sociologia Ruralis, 37*(1), 3-20. doi:10.1111/1467-9523.00033

Chambers R., & Conway G.R. (1992). Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper, issue 296. Retrieved from https://www.ids.ac.uk/publications/sustainable-rural-livelihoods-practical-concepts-for-the-21st-century/

Chen, M. (2009). Attitude toward organic foods among Taiwanese as related to health consciousness, environmental attitudes, and the mediating effects of a healthy lifestyle. *British Food Journal, 111*(2), 165-178. doi:10.1108/00070700910931986

Creamer, N. G., Bennett, M. A., Stinner, B. R., & Cardina, J. (2001). A comparison of four processing tomato production systems differing in cover crop and chemical

inputs. *Journal of the American Society for Horticultural Science, 121*(3), 559-568. doi:10.21273/jashs.121.3.559

Crowder, D. W., & Reganold, J. P. (2015). Financial competitiveness of organic agriculture on a global scale. *Proceedings of the National Academy of Sciences, 112*(24), 7611-7616. doi:10.1073/pnas.1423674112

Definition of organic agriculture. (n.d.). Retrieved from https://www.ifoam.bio/en/organic-landmarks/definition-organic-agriculture

FiBL. (2018). Organic farming statistics. Retrieved from https://www.fibl.org/en/themes/organic-farming-statistics.html

Food and Agriculture Organization of the United Nations. (n.d.). Food security for sustainable development and urbanization: Inputs for FAO´s contribution to the 2014 ECOSOC Integration Segment, 27-29 May. Retrieved from http://www.un.org/en/ecosoc/integration/pdf/foodandagricultureorganization.pdf

Food and Agriculture Organization of the United Nations. (n.d.) Why is organic food more expensive than conventional food? Retrieved from http://www.fao.org/organicag/oa-faq/oa-faq5/en/

Granatstein, D., Kirby, E., Ostenson, H., & Willer, H. (2016). Global situation for organic tree fruits. *Scientia Horticulturae, 208*, 3-12. doi:10.1016/j.scienta.2015.12.008

Josef, K., & Ondrej, M. (2018). A comparative analysis of organic and conventional farmers in the Czech Republic. *Agricultural Economics (Zemědělská Ekonomika), 64*(1), 1-8. doi:10.17221/161/2016-agricecon

Kenton, W. (2019, March 22). Sustainability. Retrieved from https://www.investopedia.com/terms/s/sustainability.asp

Krause J., & Spicka J. (2017). Analysis of economic performance and opportunities for the development of organic farming: Case study of the Czech Republic. *Pakistan Journal of Agricultural Sciences, 54*(3), 717-724. doi: 10.21162/PAKJAS/17.2527

Kremen, C., & Miles, A. (2012). Ecosystem services in biologically diversified versus conventional farming systems: Benefits, externalities, and trade-offs. *Ecology and Society, 17*(4), 40. doi:10.5751/es-05035-170440

Kristiansen, P., Taji, A. M., & Reganold, J. P. (2006). Organic agriculture: opportunities and challenges. In P. Kristiansen, A.M. Taji & J.P. Reganold (Eds.), *Organic agriculture: A global perspective* (pp. 421-436). Wallingford: CABI.

Lockeretz, W. (2007). What explains the rise of organic farming. In W. Lockeretz (Ed.), *Organic farming: An international history* (pp. 1-8). Cambridge, MA: CABI.

Martin, H. (2009). Introduction to organic farming. Retrieved from http://www.omafra.gov.on.ca/english/crops/facts/09-077.htm

Marwa M., & Scott D. (2013) An extension of the benefit segmentation base for the consumption of organic foods: A time perspective. *Journal of Marketing Management, 29* (15-16), 1701-1728, doi: 10.1080/0267257X.2013.800896

Merriam-Webster's dictionary. (n.d.). Retrieved from https://www.merriam-webster.com/dictionary/

Offermann, F., & Nieberg, H. (2000). Economic performance of organic farms in Europe. *Organic farming in Europe: Economics and policy, 5*. Stuttgart: Universität Hohenheim, Institut für Landwirtschaftliche Betriebslehre.

Organic agriculture - benefits, future opportunities and challenges. (n.d.). Retrieved from https://organicpowerfoods.com/living/organic-agriculture-benefits-future-opportunities-and-challenges

Organic and conventional agriculture. (n.d.). Retrieved from https://monsanto.com/innovations/modern-agriculture/organic-farming-vs-conventional-farming/

Paydar, L., Firouzi, S., & Aminpanah, H. (2015). The economic performance of organic and conventional olive orchards in Iran. *Idesia (Arica), 33*(3), 109-113. doi:10.4067/s0718-34292015000300015

Pilkauskas, P. and Liu, P. (n.d.). *Economic and Financial Comparison of Organic and Conventional Citrus-growing Systems in Spain: Study prepared for the Horticultural Products Group, Raw Materials, Tropical and Horticultural Products Service, Commodities and Trade Division, FAO*. Retrieved from http://www.fao.org/3/ac117e/ac117e00.htm#Toc

Pimentel, D., Hepperly, P., Hanson, J., Douds, D., & Seidel, R. (2005). Environmental, energetic, and economic comparisons of organic and conventional farming systems. *BioScience*, *55*(7), 573-582. https://doi.org/10.1641/0006-3568(2005)055[0573:EEAECO]2.0.CO;2

Post E., & Schahczenski, J. (2012). Understanding organic prices and costs of production, national sustainable agriculture information system. Retrieved from https://attra.ncat.org/attra-pub/download.php?id=419 https://attra.ncat.org/attra-pub/download.php?id=419

Rahhal, N. (2016, May 5). Growing an organic Lebanon. Retrieved from http://www.executive-magazine.com/special-report/16487

Rana, J., & Paul, J. (2017). Consumer behavior and purchase intention for organic food: A review and research agenda. *Journal of Retailing and Consumer Services, 38*, 157-165. doi:10.1016/j.jretconser.2017.06.004

Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. *Nature Plants, 2*(2), 15221. doi:10.1038/nplants.2015.221

Rigby, D., & Cáceres, D. (2001). Organic farming and the sustainability of agricultural systems. *Agricultural Systems, 68*(1), 21-40. doi:10.1016/s0308-521x(00)00060-3

Sebaaly, Z. (2012). Market opportunities of organic olive oil in Lebanese restaurants. Retrieved from http://www.databank.com.lb/docs/Organic%20sector%20in%20Lebanon.pdf

Seufert, V. (2019). Comparing yields: Organic versus conventional agriculture. In P. Ferranti, E.M. Berry, and J.R. Anderson (Eds.) *Encyclopedia of food security and sustainability* (*pp.* 196-208). Amsterdam: Elsevier. doi:10.1016/b978-0-08-100596-5.22027-1

Sgroi, F., Candela, M., Trapani, A., Foderà, M., Squatrito, R., Testa, R., & Tudisca, S. (2015). Economic and financial comparison between organic and conventional farming in Sicilian lemon orchards. *Sustainability, 7*(1), 947-961. doi:10.3390/su7010947

Sgroi, F., Foderà, M., Trapani, A. M., Tudisca, S., & Testa, R. (2015). Cost-benefit analysis: A comparison between conventional and organic olive growing in the Mediterranean Area. *Ecological Engineering, 82*, 542-546. doi:10.1016/j.ecoleng.2015.05.043

Sustainable agriculture vs. industrial agriculture. (n.d.). Retrieved from http://www.sustainabletable.org/246/sustainable-agriculture-the-basics

Torres, J., Valera, D., Belmonte, L., & Herrero-Sánchez, C. (2016). Economic and social sustainability through organic agriculture: Study of the restructuring of the citrus sector in the "Bajo Andarax" District (Spain). *Sustainability, 8*(9), 918. doi:10.3390/su8090918

Urfi, P., Koch, K. K., & Bacsi, Z. (2011). Cost and profit analysis of organic and conventional farming in Hungary. *Journal of Central European Agriculture, 12*(1), 103-113. doi:10.5513/jcea01/12.1.885

Vairo, D., Häring, A. M., Dabbert, S., & Zanoli, R. (2009). Policies supporting organic food and farming in the EU: assessment and development by stakeholders in 11 European countries. *Journal of International Food & Agribusiness Marketing*, *21*(2-3), 214-227. doi: 10.1080/08974430802589733

Vasile, A. J., Popescu, C., Ion, R. A., & Dobre, I. (2015). From conventional to organic in Romanian agriculture – Impact assessment of a land use changing paradigm. *Land Use Policy, 46*, 258-266. doi:10.1016/j.landusepol.2015.02.012

Willer H., & Lernoud J. (2017). Organic agriculture worldwide 2017: Current statistics. Retrieved from http://orgprints.org/31197/1/willer-lernoud-2017-global-data-biofach.pdf

Willer, H., & Lernoud, J. (Eds.) (2016) The world of organic agriculture. Statistics and emerging trends 2016 (17th edition). Research Institute of Organic Agriculture FiBL and IFOAM Organics International, Frick and Bonn. Retrieved from http://orgprints.org/31151/

Willer, H., & Yussefi, M. (2006). *The world of organic agriculture: Statistics and emerging trends 2006*. Tholey: IFOAM.

Williams, C. M. (2002). Nutritional quality of organic food: Shades of grey or shades of green? *Proceedings of the Nutrition Society, 61*(01), 19-24. doi:10.1079/pns2001126

APPENDIX 1

QUESTIONNAIRE

Personal Information (Respondent):

1) Age: 1) 21 – 30 2) 31 – 40 3) 41 – 50 4) 51 – 60 5) 61 – 70 6) 71 – 80

2) Gender: 1) M 2) F

3) Education: 1) illiterate 2) primary 3) secondary 4) university level

4) Experience, skills or education in organic agriculture (ex: training course…)

_____

5) Farm Location: Governorate_____; District_____

6) Number of family members: _____

Farm History:

7) When did you start farming? _____

8) Do you keep records of your intervention on the farm (ex: spraying calendar, receipts of bought products…) _____

9) Farming system: 1) conventional 2) organic 3) both

In case of Organic or Both:

10) When did you start the transition to organic farming? _____

11) When did you get certification for organic? _____

12) Is all your farm certified organic? _____

13) What products are certified and what others are not?

Certified products: _____

No-certified products _____

14) What motivated your transition to organic? Or made you start an organic production?

_____
_____
_____
_____
_____

Info on the farm:

15) Is this vegetable farm the main source of your living? If not, specify other sources

_____

16) Do you have another source of agricultural income (other than vegetable farming)?

_____

If yes, what are they? _____

17) Revenues from vegetables (an average for the last 2 years):

Vegetable grown in the previous two seasons	Quantity produced (kilogram) in the previous year	Considering the selling prices of your produce over the last two years, what was the minimum, average and maximum price you received by selling your product (net of transportation and other handling expenses) to your main buyer?			Organic or Conventional
		Minimum price per kilogram	Average price per kilogram	Maximum price per kilogram	

18) Revenues from other agricultural products if applicable (an average for the last 2 years):

Other agricultural production in the previous two seasons	Cultivated area in the previous year (dunums)	Quantity produced in the previous year/season	Considering the selling prices of your other produce over the last two years, what was the minimum, average and maximum price you received by selling your product (net of transportation and other handling expenses) to your main buyer?			Organic or Conventional
			Minimum price per kilogram	Average price per kilogram	Maximum price per kilogram	

19) Revenues outside the farm (an average for the last 2 years): _____

If applicable:

Type of other income sources in the previous two seasons	Labor-hours spent on other income (last season/year)	Considering the amount of income from outside of the farm over the last two years, what was the minimum, average and maximum income you earned per hour		
		Minimum other income per hour	Average other income per hour	Maximum other income per hour

20) Total agricultural land (dunum) owned _____; rented (what kind of lease?)

_____

Labor:

21) Labor on organic/conventional farming per vegetable

Vegetables grown in the last two seasons	Number of workers (full-time equivalent) used to grow each vegetable last season/year	Total labor-hours spent to grow each vegetable last season/year	Average hourly rate per worker

22) Labor on organic/conventional farming per practice

Practice	Number of workers (full-time equivalent) used to grow each vegetable last season/year	Total labor-hours spent to grow each vegetable last season/year	Average hourly rate per worker
Land preparation			
Composting (if done)			
Sowing and transplanting			
Pruning			
Watering and irrigation system			
Fertilizing and spraying			
Harvesting			
Other tasks			

<u>Production Costs per dunum:</u>

How much do you spend per dunum on

23) Land Rent? _____

24) Soil Management? What do you do? _____

a) What are the equipment used? _____

b) Are they owned or rented? _____

25) Fuel and Lubricant? _____

26) Greenhouses and greenhouses maintenance? _____

27) Fertilizers? How do you fertilize? _____

a) Starter

b) Nitrogen

c) Phosphorous

d) Potassium

e) Foliar spray

f) Composting (if done: what do you compost? do you buy it or have to buy any of its inputs? where do you keep it on the farm?)

28) Herbicides? _____

a) Number of sprays: _____

b) Targeted pest: _____

29) Fungicides? _____

a) Number of sprays: _____

b) Targeted pest: _____

30) Insecticides? _____

a) Number of sprays: _____

b) Targeted pest: _____

31) Mulching? _____

32) Weeding? _____

33) Irrigation water? _____

34) Labor? (planting, pruning, harvesting…) _____

35) Other production costs? _____

36) Transportation per harvest? _____

37) Organic certification per year if applicable (renewal)? _____

38) Postharvest costs (washing, refrigeration, storage, etc.) per harvest? _____

39) Other handling costs? _____

Yield:

40) What is your yield per dunum for each crop?

Type of vegetable	Cultivated land (dunums) last season/year	Total production
1.		
2.		
3.		

Marketing:

Channel choice

41) What portion of your produce reported above was sold directly to consumers? _____% (if none, write zero). Answer the following if you had sold your produce directly to consumers during the previous season

a) What was your selling price per kilogram_____

b) Where did you sell it? 1= farm gate 2= other places

c) If you sold outside of farm gate, how much did you have to pay per unit (kilogram) for transportation, loading and unloading, handling, storage and other expenses related to the sale of your produce? _____

42) What portion of your produce reported above was sold directly to a wholesaler or wholesale company? _____% (if none, write zero). Answer the following if you had sold your produce directly to a wholesaler or wholesale company during the previous season

a) What was your selling price per kilogram? _____

b) Where did you deliver the produce? 1= farm gate 2= wholesaler's location

c) If you delivered to wholesaler's location, who covered the transportation cost? _____

d) If you had covered the transportation cost, how much did you have to pay per unit (kilogram) for transportation, loading and unloading, handling, storage and other expenses related to delivering your produce to the wholesaler? _____

43) What portion of your produce reported above was sold directly to a supermarket chain (like Spinneys, Coop, TSP, etc.)? _____% (if none, write zero). Answer the

following if you had sold your produce directly to a wholesaler or wholesale company during the previous season

a) What was your selling price per kilogram? _____

b) Where did you deliver the produce? 1= farm gate 2= supermarket's location

c) If you delivered to the supermarket's location, who covered the transportation cost? _____

d) If you had covered the transportation cost, how much did you have to pay per unit (kilogram) for transportation, loading and unloading, handling, storage and other expenses related to delivering your produce to the supermarket? _____

44) What portion of your produce reported above was sold directly to a restaurant/hotel chain? _____% (if none, write zero). Answer the following if you had sold your produce directly to a restaurant/hotel chain during the previous season

a) What was your selling price per kilogram? _____

b) Where did you deliver the produce? 1= farm gate 2= restaurant/hotel's location

c) If you delivered to the restaurant/hotel's location, who covered the transportation cost? _____

d) If you had covered the transportation cost, how much did you have to pay per unit (kilogram) for transportation, loading and unloading, handling, storage and other expenses related to delivering your produce to the restaurant/hotel chain? _____

45) What portion of your produce reported above was sold directly to other retailers (green groceries, groceries, other retailers)? _____% (if none, write zero). Answer the following if you had sold your produce directly to other retailers during the previous season

a) What was your selling price per kilogram? _____

b) Where did you deliver the produce? 1= farm gate 2= retailers' location

c) If you delivered to the other retailers' location, who covered the transportation cost? _____

d) If you had covered the transportation cost, how much did you have to pay per unit (kilogram) for transportation, loading and unloading, handling, storage and other expenses related to delivering your produce to other retailers? _____

46) Do you sell all your produce at any given season? _____

47) Tell me about the demand for your produce, taking into account at least the previous two seasons?

_____
_____
_____

<u>Perception (applicable only for organic):</u>

48) Do you consider shifting to organic farming was a good step? _____

49) If yes: What is the reason? (More than one answer is possible. If you have more than one answer, start with the most important reason)

a) information about increasing demand for organic, b) better access to markets, c) conserving natural resources, d) better for health issues, e) sustainable farming, f) new trend, g) make them feel proud, h) production costs are lower than conventional, i) higher profitability

50) Do you recommend organic farming to other farmers?

5. Strongly recommend 4. Recommend 3. Neutral 2. Don't recommend 1. Don't recommend at all

Explain your answer:

_____
_____
_____
_____
_____

APPENDIX 2

FIRST INTERVIEW

Since one of the objectives of this study is to map the organic fruity vegetable chain, and to be able to do the cost-benefit analysis, I went to an organic shop in Ashrafieh which sells various organic products (not only fruits and vegetables). I had the following interview with the shop manager which focused only on the fruity vegetables, especially tomatoes. The following is the transcript:

Q: Who usually seeks the other to initiate a business relationship? Is it the farmer or the shop?

A: I found the main farmer that we get most of our tomatoes from. I usually contact him every Saturday and Wednesday in the morning and place the order. Then, the farmer sends us the order (transportation costs are on the farmer). In other cases, some farmers come to us and ask us to buy their produce, but this is not the general case because I get a big portion of what I need, if not all of it, from the first farmer.

Q: Do you make sure that he is certified? How?

A: I always ask any farmer I have to deal with to show me the certification. Once I buy from him, I do a pesticide test from time to time, without notifying the farmer, to make sure that they are really organic. I cannot do this test all the time since it costs LBP 100,000 This gives me assurance that the vegetables are organic.

Q: Do you buy the entire yield from the farmer?

A: I cannot buy the entire yield from him. He also sells a portion to Souk el Tayyeb in Beirut.

Q: Do you buy the same quantity throughout the year, or do you have a low season?

A: Summer is the low season. The demand is low in summer since many people go to their villages, so I place smaller orders.

Q: What is your order size?

A: I buy 100 kg of tomatoes every week.

Q: At what price do you buy the produce?

A: I buy the tomatoes for LBP 3000/Kg.

Q: At what price do you sell the produce?

A: On average, I sell the tomatoes for LBP 4500/Kg.

Q: Do you think these are the average prices for such products at organic shops?

A: Most organic shops sell their tomatoes for LBP 6000/Kg. We lowered our prices in order to gain more share of the market (marketing strategy).

Q: How do you evaluate Souk el Tayyeb?

A: Although Souk el Tayyeb takes a big share of the market, it has a positive impact on the organic sector in Lebanon. Many people started buying organic produce from Souk el Tayyeb at a beginning, and then became loyal to organic products, and thus started buying from organic shops. Souk el Tayyeb wins new customers in buying

organic fruits and vegetables, but cannot secure supplying all their needs since it does not open on daily basis. Here comes the role of organic shops. This Souk is benefiting all the organic sector in general.

Q: How do you evaluate the organic sector in Lebanon?

A: I have doubts concerning the certification body. How is it making sure that all organic farmers, after they got their certification, are selling only organic produce? Also, shops that say they sell organic products can be misleading. We may have corruption in this sector.

Demand is increasing, but the supply is still low. Many big producers and shops are importing organic products. This may also be due to the high prices local organic farmers ask for. Organic farmers in Lebanon are few, and the high production cost, as they claim, is the reason behind the high prices they ask for. I think production costs are not this high. This is making the organic sector in Lebanon weak.

Q: Where are your customers based?

A: Although most of them are in Beirut, we have customers all over Lebanon, due to our advertising on social media.

Q: Do you have any final comment?

A: We did a survey on 200 households in Beirut, and the results showed that 90% want organic products, but this 90% cannot afford it. Lebanese people do want organic products, but the issue is that the prices are too high. The problem lies within the entire chain, from the farmers and the big producers, to the shops and supermarkets.

APPENDIX 3

SECOND INTERVIEW

For the same purpose of appendix 2, I had an interview with an organic seller at Souk al Tayyeb (Abou Rabih Organic Farm). It is essential for this study to follow the product from the farm to the consumer.

Q: Where do you get your products from?

A: I get them from two sources, one of which is my own organic farms, and the other is another organic farmer.

Q: Who usually seeks the other to initiate a business relationship? Is it the farmer or the shop?

A: It can happen both ways. For example, the farmer came to me since he knew that I have a stand at Souk al Tayyeb, but in other cases, sellers find producers.

Q: Are all the products certified? How do you make sure?

A: For my own farms, I have the certification from CCPB. As for the other farmer, I made sure he also has the certification. CCPB is responsible for controlling this issue, it must check with the farmers every now and then.

Q: At what price do you buy the organic tomatoes?

A: I buy organic tomatoes for LBP 2,500.

Q: What is your selling price for organic tomatoes?

A: I sell tomatoes for LBP 4,000. Tomatoes have the highest demand as compared to other vegetables.

Q: What is your evaluation of Souk al Tayyeb?

A: It is a very good opportunity for people in Beirut to buy organic products. It makes organic products more accessible and easy to get.

Q: How do you evaluate the organic sector in Lebanon?

A: It is a weak sector. Farmers have no support, the economic situation is vulnerable, and people are not always willing to pay for organic products. The demand is high, and will keep increasing since this is the trend, but the supply is not increasing. Also, some shops or supermarkets may be deceiving customers saying that they are selling organic fruits and vegetables, while they are not.