AMERICAN UNIVERSITY OF BEIRUT

THE ROLE OF HOUSEHOLD-LEVEL DAIRY PRESERVATION ("MOUNEH" PRODUCTION) IN THE FOOD, PROTEIN, AND NUTRITION SECURITY, AND IN THE FOOD SOVEREIGNTY OF JORDANIAN HOUSEHOLDS

by
HANNAH NICHOLSON

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

Beirut, Lebanon
April 2019

AMERICAN UNIVERSITY OF BEIRUT

THE ROLE OF HOUSEHOLD-LEVEL DAIRY PRESERVATION ("MOUNEH" PRODUCTION) IN THE FOOD, PROTEIN, AND NUTRITION SECURITY, AND IN THE FOOD SOVEREIGNTY OF JORDANIAN HOUSEHOLDS

by

HANNAH NICHOLSON

Approved by:

Dr. Martin Keulertz, Associate Professor
Food Security — Advisor

Dr. Ali Chalak, Associate Professor
Department of Agriculture — Member of Committee

Dr. Gumataw Abebe, Associate Professor
Department of Agriculture — Member of Committee

Dr. Omar Obeid, Associate Professor
Department of Nutrition — Member of Committee

Ms. Rachel Bahn, Program Coordinator
Food Security — Member of Committee

Date of thesis defense: April 24, 2019

AMERICAN UNIVERSITY OF BEIRUT

THESIS, DISSERTATION, PROJECT RELEASE FORM

Student Name: Nicholson (Last) Hannah (First)

X Master's Thesis Master's Project Doctoral Dissertation

X 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.

Hannah K [illegible] April 30 2019

Signature Date

ACKNOWLEDGMENTS

Thank you to my thesis advisor, Dr. Martin Keulertz, for his encouragement throughout this program.

Thank you to my committee members, Ms. Rachel Bahn, Dr. Ali Chalak, Dr. Gumataw Abebe, and Dr. Omar Obeid for their feedback and support.

Thank you to my extended family who have encouraged me throughout this journey, and to Izdehar and Ruba for their assistance in translation.

Thank you to my parents for their endless support and pride in my work.

Thank you to the only God through whom everything comes into being.

AN ABSTRACT OF THE THESIS OF

Hannah Nicholson for Master of Science
Major: Food Security

Title: The role of household-level dairy preservation ("mouneh" production) in the food, protein, and nutrition security, and in the food sovereignty of Jordanian households

Background: Malnutrition is a global issue that reaches the MENA region. The literature reveals food-based strategies and indigenous knowledge as relevant and having potential for addressing the triple burden of malnutrition, and supports addressing malnutrition and food insecurity at the household level. Dairy "mouneh" are one example of traditional foods with key nutritional benefits widely produced in Jordan at the household level. There is a gap in the literature on the role of traditional foods in the food security of Jordanians, and this research attempts to shed light on this.

Objectives: This research examined the role of traditional dairy products produced at the household level, or dairy "mouneh," in the food security, nutrition security, protein security, and food sovereignty of producing Jordanian households. The role of these products was investigated with regard to consumption and therefore nutrition, production and therefore nutrition and sales, and sales and profit with regard to livelihoods and food sovereignty.

Methods: The study was conducted in the spring of 2019 in several areas of Jordan. Snowball sampling and interlocutors were used to recruit participants, who were Jordanian producers who participated in markets. Surveys were conducted covering the specific products produced, amounts produced, amounts consumed by the household, amounts sold, and profit made on sales. Participants were also asked adapted Food Insecurity Experience Scale (FIES) questions, and their level of access to markets was noted.

Results: The results of this study showed that dairy "mouneh" was produced, consumed, sold, and profited from more by food insecure households than food secure households. Additionally, households with indirect access to markets showed higher production, consumption, sales, and profit than households with direct access to markets of varying activity. Significance was observed in the relationships between market access and production, consumption, sales, and profit. It was also observed that the vast majority of producers of dairy "mouneh" are female, and the burden falls on them to provide for the nutrition and often the income of their household in this way.

Conclusion: Dairy "mouneh" play a more significant role in food insecure households than in food secure households with regard to production, consumption, sales, and profit. Food

insecure households seem to rely more heavily on dairy “mouneh” both for household nutrition and as a source of income. Additionally, households with indirect access to markets showed a higher reliance on dairy “mouneh” as a source of household nutrition and as a source of income. Therefore, dairy “mouneh” play a more significant role in food insecure households which optimize indirect access to markets. Additionally, any effort to support producers, due to the gender gap in agricultural production, would have a disproportionate impact on women.

CONTENTS

TABLES

FIGURES

ABBREVIATIONS

DIAAS: Digestible Indispensable Amino Acid Score

FAO: Food and Agriculture Organization of the United Nations

FIES: Food Insecurity Experience Scale

HCES: Household Consumption and Expenditure Survey

HES: Household Expenditure Survey

HPP: Household level produced products

IAASTD: International Assessment of Agricultural Knowledge, Science and Technology for Development

JD: Jordanian dinars

JRV: Jordan Rift Valley

Kg: kilograms

MENA: Middle East North Africa

OECD: Organization for Economic Cooperation and Development

SDG: Sustainable Development Goals

SLS: Sustainable livelihood security

SMEs: Small and medium-size enterprises

CHAPTER I

INTRODUCTION

There are unique challenges and opportunities for food security all over the world. The globalization of food and the transition towards the Western diet has not boded well for the developing world in terms of reliance on food imports, adequacy of nutrition, food distribution, or food waste. Food globalization has impacted the price of food, such that products made from wheat and corn and more processed and nutrient-poor products are cheaper than nutrient-dense fruits, vegetables, meats, and dairy. Although these cheaper products often provide sufficient calories at a lower cost, the long-term impact of consumption of low-nutrient foods becomes a burden in terms of health, with significant consequences including overweight and obesity, type II diabetes, high blood pressure, and heart disease. These health problems can take a major toll on individuals and, when aggregated across populations, national resources. These patterns are already evident in developed countries, and developing countries are progressing in the same direction.

The Middle East and North Africa (MENA) region has experienced food globalization uniquely and presents unique challenges for food security. This region is endowed with limited arable land and water resources, driving countries to more heavily depend on food imports and invest in developing their water resources and food production if they are to pursue self-sufficiency (FAO, 2017). The MENA region in general has an interest in decreasing reliance on food imports and increasing food self-sufficiency. One pathway towards this goal is continued production, sale, and consumption of local, traditional foods. Therefore, it is worth noting the

traditional, nutrient-rich foods which are still produced, sold, and consumed at large in the MENA region. Specifically, traditionally preserved dairy products are still widely produced, sold, and consumed in Jordan.

A gap in the literature exists regarding the role of traditional foods in the MENA region in local household and individual food security. Although many countries in MENA do not consistently collect data on national household food security, the Department of Statistics in Jordan has collected household data on food production for consumption at the governorate and national levels in the years 2003, 2008, and 2013. This data will be used and referred to in the Data Analysis section.

Moving from the broad picture of food security in the MENA region, it is key to investigate food security on local levels, on the regional and city-wide scale, and on the household and individual scale. Just as variety can be found in the food security of different countries, there can be great diversity between and within regions, cities, villages, and households. Rural households tend to be more at risk for food insecurity than urban households. Rural households depend more heavily on agriculture, but this comes with the insecurity and unpredictability of relying on the land and weather patterns. Additionally, rural households may more frequently than urban households experience a lack of additional income sources, lack of market or lack of resources needed to access markets (for example a vehicle to transport products to a market). Rural households may have limited access to active markets and be limited to markets that facilitate minimal success for sellers. Rural households and food producing households are more at risk for food insecurity than households which do not rely on agriculture and food production as sources of income. Therefore, it is of interest to investigate their

sustainable options for maintaining and improving food security, specifically through production, sale, and consumption of nutrient-rich foods.

The research questions of this thesis are:

1. How does traditional household-level dairy production impact household-level food security, nutrition, and livelihoods?

2. How does "mouneh" (traditional, household level food, specifically dairy) production lead to food sovereignty in Jordan?

This research has been approached with a literature review and collection of both quantitative and qualitative data via surveys. The literature review has provided a backdrop for the research, focusing on topics of malnutrition, food preservation and indigenous knowledge, nutrition in agriculture and nutrition-sensitive value chains, dairy in Jordan and in the MENA, traditional dairy preservation, methods of assessing household food security, food security in rural areas, and the gender dimension of rural work related to food. Qualitative and quantitative data have been gathered via surveys to gain insight into household perspectives on the impact of these practices on food security in the form of role in livelihoods and role in nutrition, and to learn details of production and consumption of goods produced, as well as the livelihood impacts of these practices. Questions on quantity of products produced have led to insight regarding the impact of these products on livelihoods. Questions of quantity of products consumed within the household shed light on these products' impact on household nutrition. Additionally, more general questions were asked regarding the household's experience of food security in the past year.

CHAPTER II

LITERATURE REVIEW

A. Introduction

One of the greatest challenges to be faced at this time is the question of how to empower the rural poor to maintain and improve their livelihoods and household food security sustainably. One out of five people in the world lives in absolute poverty, with no entitlements to produce or purchase the food they need, and neither technology nor food systems can bring them out of the cycle of poverty or address their hunger (Kotze, 2003). Kotze (2003) states that "food security can be regarded as the first form of security on the way to … integrated rural development" (Kotze, 2003, p. 112). Improvement in food security is a key starting point in the pursuit of development among the rural poor.

There are several ways of approaching food security. It has become evident through the work of Amartya Sen that global food security cannot be achieved only by increasing production of food; food insecurity must be addressed in terms of access to food on the household and individual levels (Sen, 1981). Sen wrote on entitlements and poverty, making the distinction between lack of accessibility, the state of not having or owning enough food to eat, and lack of availability, the lack of food that is available to be owned. He wrote that the latter may be a cause of the former, but it is likely one of many potential causes. Therefore, food security includes accessibility and availability of sufficient amounts of nutritious food. The generally accepted definition of food security is that it is a situation "that exists when all people, at all

times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996). This definition approaches food security holistically by addressing both macro- and micro-level availability of food, both access to and distribution of food and income, and by increasing both household production and income. This entitlements approach proposed by Sen emphasizes development and income generation for increased household-level food security (Sen, 1981). Although in the past the food security concept referred to sufficiency of a nation's food supply to meet its population's nutrition needs, disparate access to available food within nations changed food-related concerns about food security from the national to the household level (Millman, 1990).

Food security challenges differ in rural and urban households. Households in urban areas tend to mainly consume food, while rural households often take both producing and consuming roles. Returning to the definition of food security and the pillars, food accessibility of rural households is primarily affected by income and food prices but may also be impacted by physical resources and production capacity by extension, while utilization is mainly affected by dietary intake and diet quality. Rural households have many factors affecting their food security; therefore, Bashir and Schilizzi state that "rural household food security is an important but complex phenomenon" (Bashir & Schilizzi, 2013: p. 1252).

When food production occurs at the household level, food insecurity should be measured at that level using key indicators, because recognizing household behaviors related to food access is critical to the development of policies and programs that address food insecurity. Measurement of household food insecurity builds the basis for and directs policies and programs that can assist vulnerable populations, effectively target assistance, and evaluate impact (Smith & Subandoro,

2007). However, as stated by Carletto et al. (2013), no single instrument of measuring food security will be completely sufficient, and different entities and agencies each have their preferred method of data collection, aggregation, and analysis as it regards food security. Globally and throughout the history of thought on food security there has been little consensus on how to measure food security, reflected by the multiplicity of tools that exist for collecting data on it.

While food security is a global issue, it is especially becoming a concern in the MENA region. This region is endowed with limited arable land and water resources, driving countries to more heavily depend on food imports and invest in developing their water resources and food production (FAO, 2017). These drivers of food insecurity in the MENA region include low availability of arable land, low water resources, political tensions affecting food accessibility, and the impact of global transformation of the food system. Land ownership, access to income, endowment of resources, education level, and access to markets also impact food security. These causes of food security can be analyzed at several levels, for example at the global, regional, national, city or country section, community, household, or individual levels. Since food security cannot be separated from the agricultural and food products that are produced at the household level, food processing, preservation, production also contribute to household food security. For households which work the land, agricultural products will be processed for household consumption, consumed directly, or sold. In the MENA region, one aspect of this realm of food production impacting food security is “mouneh,” agricultural products that are processed and preserved at the household level for out-of-season and year-round consumption. “Mouneh” takes different forms around the MENA region. For example, “kishik” is a traditional

food commonly produced in Lebanon, while “jameed” is another traditional food but commonly produced in Jordan, although little “kishik” is produced in Jordan and little “jameed” in Lebanon.

In Jordan, many types of “mouneh” products are produced at the household level, from vegetable and fruit preserves to dairy preserves. This form of household-level traditional food processing may play a significant role in the food security of rural Jordanians. Rural Jordanians have unique dietary intakes and traditional meal preparation practices according to their rural lifestyle, and often preserve fruits and vegetables and process milk for year-round consumption. In general, production of traditionally preserved dairy products in MENA is done mainly by small scale local processors and at the household level using traditional methods (Hilali et al, 2011). Regarding food security, household-level food processing may increase access to and consumption of nutritious foods, addressing the accessibility and utilization pillars of food security, as a food-based strategy to combat micronutrient malnutrition (Tontisirin et al, 2002). The impact of household level food processing on household food security in Jordan has not been studied and is a gap in the literature. However, data has been collected by the Department of Statistics on household food consumption, expenditure on food, volume of food produced for household consumption, and other factors related to food security indicators (Department of Statistics of Jordan, 2013).

This thesis investigates the role of household-level traditional dairy production in increasing household food security in Jordan, inasmuch as these practices 1) support and provide livelihoods and 2) provide essential nutrients. This thesis also considers the role of market access with relation to household-level dairy processing and selling these products and the impact on rural livelihoods.

B. Malnutrition

Improvement of human nutrition, including addressing both macronutrient and micronutrient deficiencies, is essential to achieving food security. Although supplementation is an approach to addressing especially micronutrient status; food-based approaches, or dietary changes, are growing as the preferred approach, as they are often more sustainable (Ahmed, Jabbar, & Ehui, 2000). In financially resource-poor households all over the world, malnutrition and food insecurity can be caused not only by insufficient calories but also by the poor nutritional quality of the available food (Hotz & Gibson, 2007) (Carletto, Zezza, & Banerjee, 2013).

Over time, developing countries have grown more food secure in terms of food supply and food access: the number of undernourished people has decreased from 991 million in 1990 to 780 million in 2015 (FAO 2015).

One theory which could explain the transformation of food systems over a short period of time is the concept of food regimes put forward by Harriet Friedmann. Friedmann (2006) describes three consecutive food regimes, the third being the current food system marked by the 'supermarket revolution', displaced slum dwellers, conservation agriculture, the slow food movement, and food sovereignty (Friedmann, 2006). The momentum of the second regime, marked by food aid and development of the food industry, led into this third regime, and paved the way for greater food supply and food access.

In developing countries, food systems have improved their provision of calories per capita, but have not necessarily improved at providing food for a healthy diet and lifestyle to the majority of their population. However, agricultural value chains have a potentially significant role to play in addressing and reducing each of the three sides of the triple burden of malnutrition

(Allen & de Brauw, 2018). The triple burden of malnutrition is "the coexistence of caloric deficiency, micronutrient deficiency, and overnutrition or growing levels of overweight and obesity" (Allen & de Brauw, 2018, p. 23). Each of the sides of this triple burden can be addressed at the household level, and many would say that malnutrition is most effectively addressed at the household level. Calorie and micronutrient deficiency can be curtailed by supporting livelihoods and diversifying diets.

C. Indigenous Knowledge

Many attempts can be made to address malnutrition, and one is to use indigenous knowledge surrounding food. Traditional preserving of food represents part of a broader set of indigenous knowledge. Ibnouf (2012) states that indigenous knowledge can be a powerful means of sustaining household food security. Traditional and indigenous foods are cheap, safe, nutritious, and if preserved are available year-round. They also need no transportation and have cultural value. They diversify the diet of rural people and are key to survival in times of food shortage (Ibnouf, 2012). Methods of household-level food processing for food preservation are forms of indigenous knowledge but include mechanical and/or chemical processes. In practice, traditional methods of food processing and preserving can increase bioavailability of nutrients, which is a significant nutrition contribution in resource-poor communities where poor diet quality negatively impacts the nutrient availability. Methods of processing that may increase nutrient bioavailability include thermal processing, mechanical processing, soaking, and fermentation. For the purposes of this study, the definition of food preservation will be constrained to all mechanical and chemical changes that are made to foods for preservation, for diet diversification and sustainability of fruit, vegetable, and dairy consumption throughout the

year (Hotz & Gibson, 2007), including pickling, canning, dehydrating, and fermenting of fruits, vegetables, and dairy; and this research will focus specifically on dairy products in Jordan.

Within more general "mouneh" production, household level dairy processing and production as part of livestock value chains can reduce malnutrition by providing nutrition to producing families and to consuming families, as well as providing income to producers with access to markets.

Regarding nutrition, meat and dairy consumption can significantly impact human nutrition, as these foods have a generally high bioavailability of vitamins and minerals, as well as protein. Consumption of meat and dairy also enhances bioavailability of vitamins and minerals in plant-based foods eaten at the same time (Ahmed, Jabbar, & Ehui, 2000). This thesis argues that "mouneh" production could play a significant role in both these efforts.

D. Food Sovereignty

Closely related to the concept and value of indigenous knowledge is the theory of food sovereignty. First, the definition of food sovereignty should be distinguished from that of food security. Food sovereignty should be distinguished from food security, which is the ideal or goal of satisfying the need for all people to have adequate food for a healthy lifestyle. Food sovereignty proposes that there are beneficial and harmful ways of attaining food security and promotes a "best practice" approach or method of doing so that incorporates right to food, right to produce food, and the relationships this entails (World Development Movement, 2012). This concept encompasses the view that food crises are triggered by increased wide-scale dependence on food aid and agricultural imports (Italian Committee for Food Sovereignty, 2009).

Both definitions have morphed and developed since they were first introduced. Food security was first defined in 1974 by the United Nations, a definition which derived from its political-economic context. Initially, in the political-economic context, when the state was trusted and expected to manage resources in a way that was beneficial for everyone under their sovereignty, it made sense to define food sovereignty in terms of sufficient world supplies and price stabilization (Patel, 2009).

Food sovereignty is an approach towards achieving the goal of food security. Many approaches towards achieving food security exist, but this newer, vibrant approach puts food producers and food consumers at the heart of decision- and policy-making. Food sovereignty promotes peoples' right to have rights, and from there discusses the right to food. These rights include the right to produce and consume culturally appropriate indigenous foods and determine how to produce and consume these by shaping and directing food policy. Food sovereignty is a policy approach to the issues underlying food security, with a priority and focus on indigenous peoples and peoples' right to and "need for" healthy, culturally appropriate indigenous foods.

The concept of food sovereignty was born out of recognition that after many years of pursuing solutions to hunger and malnutrition, statistics of authorities like the Food and Agriculture Organization of the United Nations (FAO), International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), and rigorous research have shown failure to attain solutions and elimination of hunger and malnutrition. Recognition of this reality leads to the necessity of viewing the issues at stake as interrelated. It is not simply irresponsible individual behavior that has led to the obesity epidemic, nor is it simply government incompetence that has exacerbated livelihoods and malnutrition. Food sovereignty can be seen as a precondition for food security. This is because long-term food security depends

on food producers and a healthy natural environment. Food sovereignty is peoples' right to healthy, culturally appropriate food produced through sustainable methods, and the right to develop and maintain capacity to produce diverse and culturally appropriate foods (Italian Committee for Food Sovereignty, 2009). However, food sovereignty is also a concept that is complex and dynamic. Although the concept and language of food sovereignty is recently introduced, its principles have been applied and valued for thousands of years as indigenous communities have passed on indigenous food related knowledge and values for generations.

The pillars of food sovereignty that can be addressed in this research are the first four out of the six total: 1) the focus on food for people, 2) the value of food providers, 3) localizing food systems, and 4) putting decision-making control locally (World Development Movement, 2012). Food for people is the focus of mouneh producers, mouneh producers themselves are food providers, producing and consuming and marketing mouneh products are part of localizing food systems in Jordan and in the Levant, and producers make decisions about production locally.

In the MENA region, dairy mouneh are part of the class of traditional and culturally appropriate food. The food sovereignty framework and approach to food security is directly applicable to the mouneh-producing households of Jordanians because they are indigenous people actively producing and consuming indigenous foods, and by selling them are making indigenous foods accessible to those not producing. They are continuing to exercise their right to practice the cultural practices of producing, consuming, and selling indigenous foods, providing culturally appropriate, nutritious food for their household and community. However, these practices are declining because of a lack of the third value of food sovereignty: a dependency not only on grocery stores and corporately driven food production and consumption, but on food imports as well. Food corporations also have begun competing with household-level production

of mouneh, producing versions of these traditional foods at scale and selling them at a lower price than producing households can.

Food sovereignty relates to mouneh production in that mouneh production is an example of households practicing food sovereignty by exercising their rights to produce food for their own consumption and produce it in the way they prefer for sale to consumers. Food sovereignty can be a precursor for food security, but these concepts are not the same: those who are food sovereign may not be food secure.

E. Political Context

After discussing the background for dairy production and consumption in the MENA region, we move towards looking at the political context for food-producing activities. Nations of the MENA region have sought self-sufficiency in agricultural production since the impact of the priorities of the Nasser regime in Egypt in the 1950s and 1960s. Although historically Egypt has been an exporter of many food commodities, it has since lost self-sufficiency in many products, including the staples of broad beans and wheat, and population growth and domestic consumption overwhelmed supply such that imports were necessary starting in the period 1945-1949. By the late 1970s, Egypt's food imports amounted to over $1 billion (Waterbury, 1983). Since the Nasser era, Egypt has explicitly promoted its mandate to guarantee basic food supplies to all Egyptians. This was attempted via food subsidy policies, particularly for bread (Gutner, 2002). Egypt was one of the top wheat importers globally, but Nasser's regime pursued food self-sufficiency specifically by targeted subsidies of wheat, which comprised about half of the caloric consumption of most of the country at that time. At the time, food represented half of the budget of the average household, and up to 70% of the budget of the lowest economic quartile of

the population. Bread provided half of the caloric intake of those in this quartile (Khouri-Dagher, 1996).

Looking to the example of Egypt, several other countries in the MENA region have pursued water and food self-sufficiency, through investment policy and other means (Elhadj, 2006).

F. Dairy in the MENA region

In order to describe and discuss the "mouneh" products themselves, a brief history and context for the role of dairy in the MENA diet and landscape is required. "Dairying" originated in the Middle East between 7000 and 6000 BC. From there, milk consumption spread through the Mediterranean and to Europe, the Indian subcontinent, and other regions of the world (Moran, 2005). Although the MENA region as a whole currently shows lower dairy consumption than that of the Organization for Economic Cooperation and Development (OECD) economies, they show higher consumption than most African, Asian, and Latin American countries. Dairy consumption increases can be largely attributed to increasing per capita income and regional population growth rate increase. In several MENA countries, the dairy sector is currently considered one of the most significant components of the livestock sector (Alqaisi et al, 2010).

There are many benefits to production and consumption of dairy products. Milk and dairy products are the cheapest source of animal protein in the Middle East (Alqaisi et al, 2010). Food products sourced from animals have 'complete proteins' and are important in the human diet, especially for children to establish adequate vitamin B12 levels, and as a source of calcium and vitamins (Wilson, 2017). Therefore, dairy production and consumption significantly

contribute to not only the subsistence but also the nutrition of families and producers in peri-urban and rural areas of the region (Alqaisi et al, 2010).

Looking at the regional and national big picture, the MENA region is at an interesting place regarding dairy production. In the early 1970s, MENA countries sought self-sufficiency in milk production by setting up executive programs to promote dairy farming. Despite agricultural resources sufficient to achieve self-sufficiency in dairy production, the Arab world depends on imports more than local production to supply these products. In 2005, the Arab world imported 11.206 million tons of dairy products worth US $3.531 million, and its dairy imports are growing at the high rate of 4.6% annually. As a region, the Middle East imports more dairy products from Europe, the United States, and New Zealand than other regions of the world (Alqaisi et al, 2010). In an effort to lower dependency on international dairy sources, many countries in the region have begun promoting their local dairy sectors. Local governments have done this by focusing on modern, capital-intensive, and large-scale dairy production to meet urban consumer demand. These initiatives included imports of high-yielding dairy cows from the United States, Australia, countries in Europe, and other countries. Through these efforts, the region has since seen significant growth in the dairy industry accompanied by potential for exports (Alqaisi et al, 2010). In fact, due to its growth rate, the dairy industry is regarded as "one of the most progressive food industries in the Middle East." (Alqaisi et al, 2010, p. 1063).

Although large-scale and international production and sourcing of dairy products and other foods (food globalization) is predominant, local agricultural still plays a prominent role in the MENA region. Even despite the emergence and prominence of petroleum in the region, this region depends on agriculture and rural economy. The MENA region currently has an agricultural or rural population of 44.2%, so the role of agriculture is reflected also in human

resources. Sheep and goat production still contribute to livelihoods of small-scale resource-poor farmers. Region-wide, sheep and goat production account for 28-58% of the region's agricultural output. Additionally, both fresh and soured milk are important in the traditional Arab diet, and sheep and goat milk products especially retain high importance in Arab countries and are largely preferred over cow milk products. Milk production from sheep and goats is seasonal, with sheep lactation ending in early summer and goat lactation ending in September. Households and small-scale enterprises process this milk to produce yogurt, local cheese, and jameed in the case of Jordan, alongside many varieties of other dairy products (Hilali, El-Mayda, & Rischkowsky, 2011).

Thus, the dairy sector in nations of the MENA, both in large dairy industries and in rural areas where household dairy production persists, has a crucial role to play in achieving greater sustained growth and economic development in the region.

Other nations in the MENA have been developing their dairy industries, but perhaps are not as invested in local dairy production. However, their investment in dairy regardless of source speaks to the value of dairy in the present-day Arab diet. Saudi Arabia has in recent years expanded their dairy farming industry, with large-scale milk production and processing taking the place of small-scale local production following the discovery of oil and migration from villages to cities (Sadi, 2014). Evidence of the persistence of small-scale production includes financial and technical support from the Saudi Arabian Agricultural Bank and entrepreneurs for local farmers, such that they have become self-sufficient in milk production and processing (Narayana & Gupta, 2013). Similarly, Qatar currently depends heavily on imports of dairy products, so much so that one of Qatar's first responses to the 2017 Saudi-let embargo was

airlifting dairy cattle in order to replace supply to meet the demand for milk and milk products (Collins, 2018).

After discussing dairy production and consumption in the MENA region, the scope of the discussion will be narrowed to the Kingdom of Jordan. In the mid-1990s, Jordan's livestock population and milk production supplied 50% of local consumption at 165,100 metric tons, comprising 65% cow milk, 23% sheep milk, and 12% goat milk. Imported milk powder contributed to meeting the remaining 50% of demand (Alqaisi et al, 2010). At that point, about 60% of sheep and goat milk is used to produce white cheese, 30% to produce "semn" (salted fermented butter) and "jameed" (dried buttermilk), and 10% is drunk fresh (Alqaisi et al, 2010). Still in this era, throughout Jordan 2.37 million sheep and almost 1 million goats, 92% of which were local black Baladi goats, contributed to milk production. Although small-scale, traditional household dairy processing is an important activity in Jordan, in recent years about 95% of locally produced milk has been delivered to factories for commercial processing. This 95% comprises mostly cow milk (93%) and 2% sheep and goat milk. This leaves only 5% which is processed at the household level (Wilson, 2017). However, this 5% processed at the household level can have significant implications for households which depend on this as their livelihood and source of protein.

Dairy consumption has increased at high rates in the last decades, due to an annual population growth rate of 2.9% and other factors, with Jordan's annual per capita consumption of dairy products reaching 78 kilograms (kg) (Alqaisi et al, 2010).

During the period 2002-2007, Jordan experienced an increase in per capita food consumption of 6.7% annually. This was higher than other countries in the region; for example, 1.9% and 0.3% in Syria and Saudi Arabia, respectively. During the same period, Jordan's

growth of consumption of dairy products specifically was a high 9.5%. Therefore, Jordan's increase in dairy product consumption contributed significantly to the overall increase in food consumption. In Jordan, 94% of cow milk produced is delivered to dairy processing plants for modern processing, while the rest is processed on a smaller scale. In these small-scale production cases, on-farm consumption is high and production is mainly for subsistence (Allen & de Brauw, 2018).

Dairy imports and exports are growing in Jordan in terms of volume and value. Small ruminant milk production is also expanding in Jordan, with sheep and goat milk production reaching 20,000-32,000 tons in 2007.

Jordan has seen progress towards dairy self-sufficiency from 35% in 1980 to 57% in 2006. Additionally, annual milk production (from cows, sheep, goats, and camels combined) doubled in Jordan between 1996 and 2007, from about 150,000 tons to about 300,000 tons (Alqaisi et al, 2010).

G. Climate and agriculture in Jordan

The climate in Jordan impacts the crops that can grow, the number of seasons in which to harvest different crops, and the low-cost options for storage and preservation of foods.

The climate and rainfall patterns of Jordan vary throughout the country according to topography. Jordan is divided into three regions each with unique climates: the highlands, the eastern desert, and the Jordan Rift Valley (JRV) or the "Ghor." Jordan's climate is semitropical in the JRV, Mediterranean in the highlands, and influenced by the continent in the eastern desert and plains. Winter is rainy, and in the JRV is warm, in the highlands is moderate to cool, and in the desert is very cold and dry. Summer in the JRV is hot, in the highlands is moderate, and in

the desert and plains is hot. Rainfall in Jordan generally occurs between October and May, but throughout the country annual rainfall ranges from 50 mm in the eastern and southern desert to 650 mm in the northern highlands. More than 91% of Jordan receives less than 200 mm rainfall each year, and the average for the country between 1937 and 2005 has been 94 mm.

This climate, coupled with fertile soil, high winter rainfall and widespread use of irrigation in the summer has made the "Ghor" the food bowl of Jordan. It is the most fertile area in the country, and it is warmer than the rest of Jordan by several degrees and has an average annual rainfall of between 100 and 250 mm. Small scale dairy farming is practiced in the "Ghor," but large-scale dairy farming is not common due to high temperatures, humidity and incidence of disease. Typical farms in the "Ghor" have between 1 and 5 cows. Outside of the "Ghor," dairy farming is more common in areas surrounding big cities such as Amman, Irbid, Madaba, and Jerash. In these areas the average rainfall is between 200 and 300 mm.

Due to Jordan's endowments of varied climate and rainfall patterns, with only 10% of total land area available for agriculture, agriculture and animal husbandry in Jordan is done carefully, with minimal food waste. Over the generations this expresses itself in the form of food preservation, and these practices have become part of the tradition and identity of Jordanians (FAO, 2008).

H. Dairy products: "Jameed" and others

The climate of Jordan is such that lower income families choose to preserve fruits, vegetables, and dairy products in order to diversify their diet by consuming them year-round. Since ancient times, households in the MENA have practiced traditional small-scale processing, including dairy processing. Benefits of processing milk into secondary products include

prolonged life, ease of storage, enhanced digestibility, delayed or inhibited microbial degradation, and improved taste (Wilson, 2017).

"Jameed" is sun-dried fermented cow milk, which has several nutritious qualities and is used in making "mansaf" among other traditional Jordanian dishes. "Jameed" is often produced in the spring season due to availability of an excess of goat and sheep milk, and its production allows this excess dairy to be saved and consumed at a later time when goats and sheep are not producing milk. "Jameed" can be stored at room temperature for several years without affecting its biological and nutritional value (Alu'datt, et al., 2015). Additionally, "labaneh", similar to sour cream, is a popular food throughout the Middle East, and especially in the Levant. "Jameed" (dried yogurt), "labaneh" (cream cheese), "zibdeh" (butter), "jebneh" (cheese), "ashta" (cream), and "samneh" (shortening) are all examples of preserved dairy foods produced in and unique to the Arab world, often at the household level using traditional methodologies (Wilson, 2017).

I. Assessing household food security

With this background on Jordan's dairy industry, climate, and products, the discussion moves towards assessment of food security in the MENA region. In order to assess food insecurity in a population, reliable data must be gathered describing the food security status of that population (Nord et al, 2002) (Carletto, Zezza and Banerjee, 2013). While there is little disagreement about this, the way different agencies prioritize indicators and methods of gathering data regarding food insecurity vary greatly. Additionally, most parties agree that no one index or set of indices can capture all aspects of food insecurity (Carletto, Zezza and Banerjee, 2013) (Napoli, 2011). Amartya Sen is one example of this reality, who discovered through his work that access to food must be addressed alongside increased production of food

but introduced the idea that increased production does not guarantee universal access to that food (Sen, 1981).

Although there are many levels at which to address food security: the national, city, population, community, and household levels; efforts to address food insecurity must begin with an accurate measurement of key indicators at the household level (Smith and Subandoro, 2007). As a starting point, the Department of Statistics of Jordan has collected household-level data on several indicators including food production, consumption, and production for consumption in the years 2003, 2008, 2013 at the national, urban, rural, and governorate levels. This data will be used to give a background and quantitative data context for the qualitative survey instrument used by the researcher at the household level in several governorates.

J. Agriculture, nutrition and markets

One approach to addressing food and nutrition security globally has been the Sustainable Development Goals (SDGs). The second of the SDGs is the goal to achieve food security and improve nutrition while promoting sustainable agriculture (UNDP, 2018). One value of this goal is that it connects agriculture directly to nutrition and health. Despite economic and agricultural development in many countries, these countries retain high malnutrition rates due to the complexity and multidimensionality of the malnutrition problem (Maestre, Poole, & Henson, 2017). The approach towards attaining SDG 2 must therefore include an effort not only to produce more calories globally and locally (addressing part of the triple burden of malnutrition) but also to "provide a healthier basket of foods in a cost-effective and environmentally-sustainable manner" (Allen & de Brauw, 2018, p. 22).

Although SDG 2 seeks to link agriculture and nutrition, Maestre et al. (2017) write that thus far the literature does not support strong linkages between investments in agriculture and improvements in nutrition. They suggest that interventions focused on markets, distribution, and education may be more effective at improving nutrition than agricultural interventions (Maestre, Poole, & Henson, 2017). Additionally, in her study of women in agriculture and the value of livelihoods, Kotze writes of smallholder development in southern and eastern Africa and notes that, depending on the context, the path toward achieving food security may be more direct via non-food income-generating activities as opposed to on-farm production, or through market-related activities as opposed to agricultural activities (Kotze, 2003). This raises the questions 1) Is agriculture an effective means of rural poverty eradication? and 2) Is food production the most effective means towards food security? Additionally, FAO states that "governments, donors and development practitioners now recognize that agriculture is central to economic growth and food security" (FAO, 2011, p. 3).

However, Allen and de Brauw discuss how interventions through agricultural value chains can play a key role in affecting a range of actors within the value chain, each of which are essential to providing more nutritious food, including input providers, traders, processors, and consumers. Allen and de Brauw also state, "to ensure that value chain interventions have sustainable impacts on nutrition outcomes, interventions must engage with the private sector throughout" (Allen & de Brauw, 2018 p. 27). While some of these private sector actors may be large multinational corporations, others may be small- and medium-size enterprises (SMEs) or even individuals who aggregate, store, transport, and/or sell food. In order for the private sector to adopt and pursue goals of improved nutrition and sustainability, profit incentives should also be incorporated into the value chain. Therefore, in summary, agriculture, the private sector, and

their intersection can play a significant role in increasing availability and accessibility of nutritious food (Allen & de Brauw, 2018).

Regarding the role of markets, the World Bank holds the view that "well-functioning agricultural markets and agribusinesses that are inclusive and efficient – and that optimize the sustainable production and distribution of food – are essential for a food-secure future for all" (World Bank Group, 2016, p. vii).

K. Household food security in rural areas, the market, and livelihoods

To further expand on the idea of pursuing food and nutrition security through agriculture and markets, we turn our discussion towards livelihoods and household food security in rural areas.

For rural populations, food availability can be divided into two categories: self-production and market purchases. Household-level food processing in rural areas would incorporate food sources from both self-production and market purchases. For example, some rural households may farm and only process the crops they harvest, but other households may purchase vegetables from a farmer and preserve and consume them as a household. Rural households in general often assume the roles of both producer and consumer, with food accessibility of rural households primarily affected by income and food prices, and utilization mainly affected by dietary intake and diet quality (Bashir and Schilizzi, 2013). Therefore, Bashir and Schilizzi (2013) state, "rural household food security is an important but complex phenomenon" (Bashir and Schilizzi, 2013, p. 1252). These activities can be summed up as livelihood activities.

Ahmed et al (2017) found that, in most developing countries, the main factors affecting the food security of small farming households are lack of resources and low market accessibility. In their study, the subjects perceived any increase in food prices, crop diseases, lack of water for irrigation, and increase in health expenses as livelihood risks. Additionally, the study found that family size, monthly income, food prices, health expenses, and debt influenced the households' food security status. Market accessibility for these households was influenced by the factors of road distance and transportation cost (Ahmed et al, 2017). These perceived risks and factors influencing food security for households in developing countries can be applied to households in Jordan, specifically rural households, as rural areas of Jordan are less developed and face similar challenges to other developing countries.

Livelihood security is a concept that, especially in rural areas, can put the problem of access to food in a wider context. "Sustainable livelihood security" is defined in the following statement: "Livelihood is defined as adequate stocks and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risks, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis" (Kotze, 2003, p. 113). Using this sustainable livelihood security concept, people have an interest in non-food expenses and in conservation of resources needed to ensure their livelihood in the future, instead of being interested solely in food-related resources and activities. This is also related to Sen's view of food security discussed above.

L. The gender gap in agricultural work and food production

The gender gap in agricultural work and food production and distribution is necessary to discuss, as well as the role of women in these activities. A general background of women in agriculture will be given, followed by a discussion of women in household-level food production and processing.

Women contribute significantly to agricultural and economic activities at 43 percent of the agricultural labor force of developing countries, having roles managing complex households, as farmers, and as unpaid laborers. They work in crop and livestock production at both subsistence and commercial levels, producing both food crops and cash crops, managing agricultural activities which mix crops, livestock, and fish farming. Women in agriculture also work in rural enterprises for a wage, collect water and fuel, do marketing, and process and prepare food, in addition to caring for family members and maintaining their homes. Although these latter mentioned activities are not counted as economic activity or employment and do not generate a wage, they are vital to rural household well-being and sustainability (FAO, 2011).

With their unique roles and responsibilities in the agriculture sector, women face different challenges than men do. According to global figures, in the majority of countries, women working for a wage in rural areas are both more likely to hold seasonal, part-time, low-wage jobs than men, and more likely to receive a lower wage than men for the same work (FAO, 2011). This reality sheds light on the vulnerability of women in agriculture and speaks to the difficulties faced by rural households. Gender-based discrimination, wherever it occurs in the developing and developed world, has an impact on food production and implications for food security (Assan, 2014).

Beyond general agricultural activities women participate in and their implications, food production and processing will be looked at more specifically. Women farmers across the globe and across the ages have used traditional knowledge in their agricultural work to "sustain the production of certain types of staples that are also so important for nutrition" (Narasimhan, 2011). For example, in many African countries, in addition to producing 70 percent of the food, doing 60 percent of the marketing, doing at least half of the food storing and animal raising tasks, and collecting most of the water and fuel, women do all of the food processing. In fact, any difficulties or obstacles in food preserving and storing during the harvest season can lead to food insecurity during the dry season (Gittinger et al, 1990). Little attention paid to work done by women specifically in food processing in rural communities can have an impact on production and household food and nutrition security (Kerr, 2016). Kotze agrees with this and states that policies, programs, and initiatives that do not put the food producers and the home economy first will not be successful in eliminating hunger. Since rural women in the developing world generally take the role of providers of food and nurturers of children, women will play a key role in any effort towards increasing food production and security (Kotze, 2003). She discussed the concept of "sustainable livelihood security" to sheds light on the contribution women make towards household food security. Njoki Nathani Wane also writes on food processing, using a feminist approach to shed light on the important contribution of women to agriculture, and more specifically to addressing food and nutrition. She reveals the important gap of knowledge production on food processing by describing indigenous Kenyan knowledge. It is important to become aware of the roles of women in agriculture and food production in order to learn their nutritional status, which is often lacking, since they are often the most overworked members of

the household (Kerr, 2016). In her writing, Wane describes and studies rural women, noting that often food production is their main source of income, and is also gendered work (Wane, 2003).

In the MENA region, the portion of the agriculture labor force represented by women is significant. This proportion has risen considerably from 30 percent in 1980 to almost 45 percent. Within the MENA region, Jordan has one of the highest and fastest growth rates of female agricultural labor (Ilahi, 2000). Looking at the case of Jordan, there is an invisibility of women's work, as evidenced in HCES data showing an approximate 5:1 male to female ratio of employment (Department of Statistics of Jordan, 2013). Although women are greatly underrepresented in the workforce in Jordan, they may still be heavily involved in both agriculture and food processing. For example, in the Middle East including in Jordan, women have been successfully preserving foods for consumption in the winter for generations. While they may face some of the same difficulties as women in African countries, the climate and tradition have allowed this practice to develop and continue.

CHAPTER III

METHODOLOGY

This thesis uses food sovereignty as a theoretical framework and is based on qualitative and quantitative data on household-level food processing collected with snowball method surveying, using several community leaders as liaisons between the student researcher and the producers. This research reviews the household production for household consumption data presented by the Department of Statistics of Jordan and analyzes the data collected via surveys of producer-vendors of household-level preserved dairy products. This has been done in an effort to determine the role of household-level dairy preservation on the household's livelihood or income and their nutrition, shedding light on the impact of these activities on the household's food security.

A. National household surveys

Nationally representative, multipurpose household surveys are being increasingly used by a growing number of studies as a proxy to measure food consumption instead of 24-hour recall data and observed-weighed food record data. Though most nutritionists regard the latter as the gold standard source of food consumption data, the cost of carrying these out has long been a barrier to evidence-based food and nutrition policy. Household Consumption and Expenditure Surveys (HCESs) carried out by national and international entities are becoming increasingly accessible (Fiedler et al., 2012). National household surveys have several benefits and some

drawbacks when used as tools to assess food security in rural areas. First, although they are not designed to analyze food security, they collect food consumption data, either as food consumed or food acquired, in monetary and quantity values. Despite the challenge to distinguish between food acquired and food consumed, among poorer populations food storage is not as affordable, so amounts of food acquired and food consumed by the household are often similar. Second, although households produce, acquire, and consume different foods in different seasons, HCESs cover the territories of the entire country and sample throughout the year, taking seasonal factors into account (Moltedo, Cafiero, & Wanner, 2014).

National household surveys are not administered in every country, as they are expensive, complex, difficult to administer, and subject to measurement error. Therefore, their usefulness for supporting national food and nutrition policy-making is limited. However, there is growing recognition that HCESs can address gaps in food consumption and food and nutrition information (Fiedler et al., 2012). Also, the International Food Policy Research Institute (IFPRI) has also produced a guide to using household expenditure surveys (HESs) as a method of collecting data for measuring food security at the household level. HCESs used by Fiedler et al of United Nations University and HESs used by Smith and Subandoro of IFPRI differ in that HESs are household surveys that focus on food acquired by the household, while HCESs distinguish between that and food consumed by the household. In these surveys, data are collected on all foods acquired by households, including purchases and production, as well as foods consumed from personal farms and gardens, and foods received in-kind. This kind of food-related data collection has traditionally been limited to data on the monetary value of foods. However, food security must be measured based on estimated quantities of foods acquired by

households instead of simply the financial commitment food represents, and HESs and HCESs assist in this (Smith and Subandoro, 2007).

B. Study design and population group

This research is an observational, descriptive study of the role of dairy preservation in household food security in Jordan. After receiving approval for this study by the Social and Behavioral Sciences Institutional Review Board at the American University of Beirut on January 30, 2019, participants were selected via community interlocuters and snowball (referral) sampling.

Interview questions were developed to gather data on household food security, household nutrition, and livelihoods. Specifically, questions were prepared regarding which dairy products are produced by the household currently, quantity produced, quantity consumed, sales of each product, and profit from total production. Additionally, questions regarding details of the household were asked, specifically the number of members in the household, how many are over 18 and under 18 years old, how many members work, whether those who work do so for a salary or a daily wage, and how many members are retired. Questions were also asked about the household's expenditure on food and within that on fruit, how many meals the household eats per day, and a question was adapted from the FIES surveys to discern the participant's perceived food security or insecurity of his/her household. Income spent on fruit can be an indicator of diet diversity, while income spent on food can indicate the dependence on household production for diet and dependence on external market food sources for diet. The number of meals eaten by a household per day can indicate whether the household needed to miss or skip a major meal due

to lack of quantity of food. In addition to the questions above, the gender of the participant was noted.

The eight Food Insecurity Experience Scale (FIES) questions were translated, adapted to the local context and consolidated into three culturally appropriate questions that would facilitate honest responses from participants. This was done with the guidance and assistance of the first two interlocuters. The questions were worded in such a way as to learn about surface signs of the concepts the FIES questions addressed and coping mechanisms that arise due to household food insecurity, with wording more appropriate within the language and culture, and not as offensive or direct as the original FIES questions. Using the eight original questions would have been a risk, as they seemed invasive enough that the participant may have refrained from communicating his/her experience honestly or thoroughly or may have refrained from continuing with the survey questions. While this adjustment prevents comparison with other data collected using the FIES tool, it allows a window into the level of perceived food security of the participant households. Appendix 1 provides the survey including the questions asked.

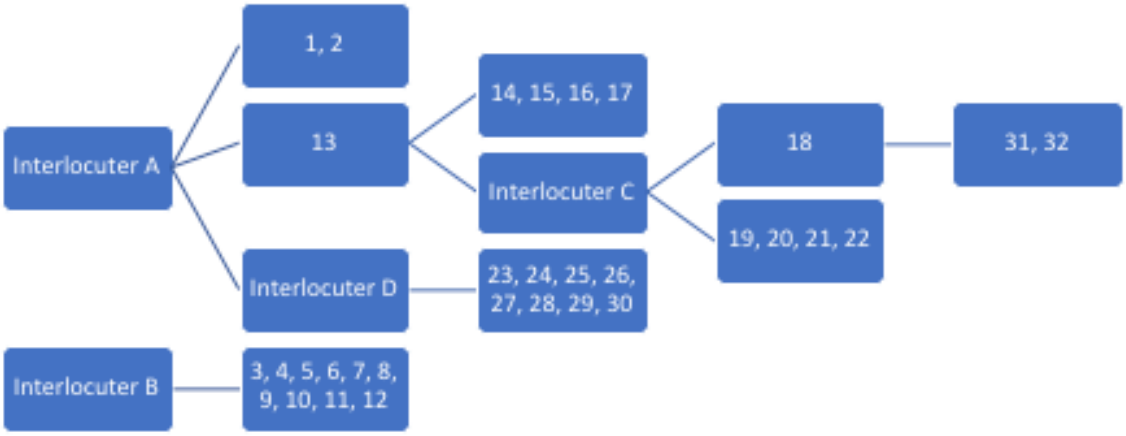
The target population group included Jordanian producers of traditional preserved dairy products who not only consume their products within their household but also sell them in some form of market (producers with market access). The participation requirements included 1) current or recent (within the last year) production of traditional preserved dairy products, 2) current consumption of their products within their household, and 3) the participant must be a vendor with access to a market to sell their product. Here market is defined as a formal market (requiring payment to reserve a table), an informal souk (requiring no payment and perhaps existing illegally), or a network of consumers who order products to be delivered to them.

Participants must be Jordanian adults (over 18 years old) and must not be displaced persons or refugees residing in Jordan: any of these will be excluded from this research, as they are vulnerable populations and in order to constrain the research to Jordanian nationals and adults with greater knowledge and experience interacting with these products.

The main producer and/or vendor of the household has been preferred as a participant, or someone in the household who is acquainted with the production, feeding, and selling activities. If this household member was not available or willing, a member of the household with knowledge about the food production, consumption, and sales of the household has been interviewed as a participant. Those participants who gave their consent and were willing to complete the entire survey were used as sources of quantitative and qualitative data. The data resulting from the sample of 32 participants describes the role of household-level dairy preservation in the nutrition of households and in income and livelihoods of households. This sample includes producer-vendors of up to eight different traditional products ("jameed," "labneh," "laban," "jebneh," "shanineh," "ashta," "zibdeh," and "samneh") from four different governorates within Jordan (Karak, Balqa, Amman, and Ajloun).

C. Sampling framework and recruitment of participants

Figure 1. Participant recruitment and snowball referrals



Source: created by author

Figure 1 above displays the snowball sampling that was used. Interlocutors were individuals with relationships to potential participants who did not themselves participate in the survey.

By way of interlocutors, vendors of preserved dairy products at markets in Amman were approached, and the snowball or referral sampling method was used to further select a total of 32 participants to survey. Sampling was initiated via interfacing with community interlocutors, who were discovered upon visiting markets in Amman which sell traditional and household-level produced products. With the assistance of these community interlocutors, prospective participants were approached. Four interlocutors assisted the student researcher in connecting to other markets with producers and vendors from around Jordan. The first interlocutor introduced the student researcher to 3 participants, and the second to 10 participants. Additional interlocutors were discovered at these markets, one who connected the student researcher to

participants in Ajloun, and one who connected the researcher to participants near Salt in Balqa, such that a total of 32 participants engaged in this study.

Following the surveys, participants were given printed information about the study including the research team's contact information and asked to refer the researcher to other potential participants (relatives, neighbors, etc.) who met the participation requirements, and participants 13 and 18 did this (see above chart). These referrals resulted in access to additional participants who consented to carry out the survey. Participants sometimes connected the student researcher with participants from the same village or governorate of Jordan, and sometimes with participants from other areas of Jordan, which allowed for more diversity and representation (regarding regions of Jordan, levels of market access, and types of products) within the sample.

The 32 interviews were carried out in markets, in homes, and over the phone, depending on the preference of the participant. Participants who preferred to carry out the survey in the market were surveyed at that time in the market, while participants who preferred to complete the survey in the privacy of their home were visited and interviewed in their homes.

Participants were briefed of the risks and benefits of participation in the study via the verbal consent script and consented. Those who did not consent to participate in the study were excluded from the study and are not included within the 32 interviewees.

D. Ethical considerations

Participants may be of different economic means and educational level than the student researcher, a divide that must be mitigated. In an effort toward this end, the student researcher brought a translator to each interview, who both provided technical assistance for translation and

cultural and social assistance as a same-culture figure more accessible and with more in common with them than the student researcher.

E. Data Analysis

Household-level food preservation was analyzed as a method of sustainably creating access to nutritious food by consumption of traditional foods produced and by income from sales of traditional foods produced. The Department of Statistics data, the qualitative data and the quantitative data have been analyzed.

First, the data regarding household food security of the participants has been analyzed, then the data regarding nutrition and protein security, and finally that regarding livelihoods. Additional variables were created based on direct responses of the participants: a market access classification and a food security classification. The market access classification involved three categories, defined by level of market access: direct access to active markets, indirect access to markets, and direct access to inactive markets. The food security classification was binary. Respondents who answered "yes" to two or three of the three questions adapted from the FIES questions, they were classified as food insecure, while respondents who answered "no" to two or three of the three questions were classified as food secure. Appendix 1 shows the adapted FIES questions.

The Chi Squared test and the Bonferroni test have been used to find p-values indicating significant relationships between variables and the location of that significance within the variables. The data will next be discussed in the context of a theoretical framework, outlined in the literature review. Conclusions have been drawn regarding the research question.

CHAPTER IV

DATA ANALYSIS

A. Introduction

This section of the thesis will begin with a discussion on nutrition, followed by a discussion on livelihoods and ending with three key components of the research related to household food security.

This thesis research has investigated the relationships between “mouneh” production and household food security, nutrition, and livelihoods of dairy “mouneh”-producing households and individuals within these households. The analysis will be laid out in three sections with the first discussing impact of the products on household food security will be analyzed, followed by the impact of the products on household nutrition and finally their impact on livelihoods. It is evident from the data collected that dairy “mouneh” plays a key role in each of these areas, although its extent varies between food secure and food insecure households. Data collected related to general food security of the household will be discussed in the first section, data collected on individuals and specifically consumption data will be discussed in the second section, and the third section will focus on sales and profit data and discuss market access, how this varies between food secure and food insecure households and varies on scale of production.

All of the data collected via participant interviews is related to the impact of products on the food security of the household. Specifically, the data collected relating specifically to household food security included:

1. Participant’s perception of food security

2. The Market Access (processed data) variable
3. The questions regarding household information (number household members, number employed household members, location of household, etc.)
4. Questions of food production (type, amount, frequency)
5. Questions of sales of product and profit made
6. Questions of food consumption (of products and in meals per day)
7. Questions of spending on food

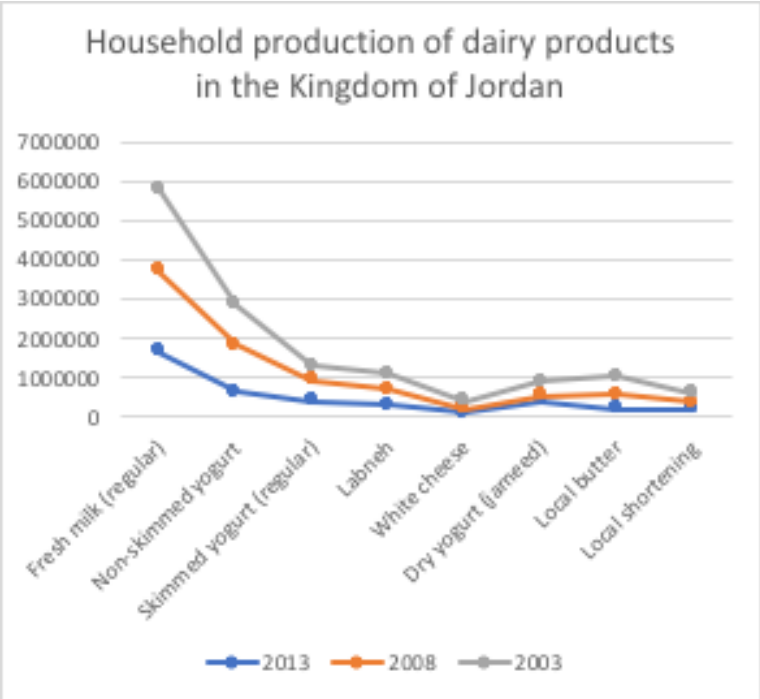
B. Household food security

Household food security of rural Jordanians is lacking, like other rural populations in the MENA region, and is of key importance to the overall food security of the nation. As discussed in the literature review, there are many factors that impact household food security and insecurity. To use the pillars of food security, accessibility, availability, utilization, and stability all play into food security of the household and individuals within it. Additionally, household food security has specific challenges unique to households in the MENA region and more specifically households in Jordan. The particular challenges of rural, traditional food-producing households in Jordan will be described and analyzed. This section describes how the data answers the question: "How does 'mouneh' production impact household food security in Jordan?"

First, we consider data collected by the Department of Statistics of Jordan on household-level food production for household consumption, specifically looking at traditional, local dairy products. The Department of Statistics of Jordan collects data on a national scale on the same

products that the survey participants produce: milk, non-skimmed yogurt (“laban rayib”), skimmed yogurt (“laban mkheiD”), “labneh,” white cheese (“jebneh”), dry yogurt (“jameed”), local butter (“zibdeh baladi”), and local shortening (“samn baladi”). The products produced by participants but that were not included in the Department of Statistics data were “shanineh” and “kishik.” Together these products make up a portion of the Jordanian diet as significant sources of protein, sugar (lactose), fat, and calories, along with Calcium and vitamins A and D, and others, depending on the animal source of the milk. The same terms used in the report for each product are used below. This data is part of data collected by a census taken every 5 years at the governorate, rural, urban, and national level.

Figure 2: Annual household production (in kg) of dairy products for household consumption in the Kingdom of Jordan



(Department of Statistics of Jordan 2013)

The data in Figure 2 above is in kilograms of product produced annually on a national scale, only including the production that is specifically for household consumption. Figure 2 reveals a decrease over time in production of each dairy item at the household level. There is a drop of about 2 million kg milk produced every five years for household consumption; this drop is the most drastic, as all the products following are produced from this milk. A larger drop in production of non-skimmed and skimmed yogurt occurred between 2008 and 2013 than between 2003 and 2008. There is little change in the production for household consumption between 2008 and 2013 of "jameed", a key ingredient in the very traditional "mansaf", and the product that is the most time-consuming to produce and which sells for the most. The Department of Statistics has not collected data on household production for sale.

This research looks at production both for household consumption and for external consumption via sales, and how regardless of the destination of the product, household-level production impacts household food security.

Next, it is useful to consider product produced in rural areas annually on a national scale, compared to product produced in urban areas annually on a national scale. These numbers can also be divided by the respective rural and urban populations, to find the per person value of amount of product produced. This data would also only account for total household-level production for consumption, excluding production for sales.

Dairy production in urban areas and rural areas can also be observed in this data, including population information, to see if production is increasing or decreasing in general, and if production is increasing or decreasing on an individual scale. Perhaps a household value could be determined from this as well.

The qualitative comments mentioned by the participants regarding their perception of their household's food security (adapted from the FIES questions) are discussed next. The qualitative data of this study has to do with addressing perception of food insecurity and perception of food-related problems and potential solutions. The qualitative data emerges from the answers to two questions. Before these two questions were asked, the participant was asked "In the last year, have there been any hard times for your household, such that you did not have enough to eat?" If the participant answered "Yes," he/she was asked, "What do you see as the reason for these difficulties?" and "What do you see as a solution, or what do you feel would help you?"

After being asked about details of household level production, consumption, and sales, and some details regarding their household, each participant was asked whether his/her household had experienced a physical lack of food in the past year. This issue would fall under the availability and accessibility pillars of food security, as physical lack of food points to lack of purchasing power (accessibility) or lack of product resulting from low production, negative environmental factors, and negative human factors such as theft (availability).

Of the 32 interviewees, six identified based on the FIES questions as "food secure" by answering 'no,' while 26 identified as "food insecure" by answering 'yes.' The interviewees were from many areas of Jordan, including the Ghor (Jordan Valley), Ajloun, Jerash, Irbid, Balqa, Zarqa, and Amman. Households ranged from two to 20 household members. Only one participant out of the 32 was male. Households ranged from supported by zero salaried or daily wage work or pension, to one household supported by four salaries, and everything in between. Households ranged from zero household members under 18 years old to 71% of the household under 18 years old.

Table 1: Issues mentioned when asked about perception of household food security, and the number of participants who mentioned each issue

Issue Mentioned	Occurrence	Share of Total
Lack of transportation	2	6.3%
Lack of land	2	6.3%
Environmental factors	2	6.3%
Inadequate production	3	9.4%
Tired / done (“Taabane”)	4	12.5%
Inadequate human resources	7	21.9%
Lack of marketing or low demand	12	37.5%
Inadequate number of animals, animals died or stolen, or sold the animals	13	40.6%
Finances	25	78.1%

Table 1 above describes the issues mentioned by participants and the number of participants that mentioned each issue, with “occurrence” referring to the number of participants that mentioned each respective problem. Participants often indicated more than one issue or factor contributing to food insecurity. The most commonly mentioned issues or areas for improvement were first finances (78.1% of participants), second animals for production (40.6% of participants) and third marketing and demand (mentioned by 12 out of 32, or 37.5% of participants). Other issues mentioned included lack of assistance (especially male assistance) in production and taking care of the animals (21.9% of participants) and the word “taabane” was used as a reason for food insecurity (12.5%), which describes “mouneh” production as hard work with challenges. Within the broad category of finances, lack of money was mentioned (25% of participants) as well as high price of animal feed (28.1% of participants). The number of animals owned by the household directly correlates to the amount of milk that can be produced and therefore the amount of dairy products that can be produced, consumed, and/or sold. The third most common issue mentioned by participants relates to level of market access. Due to the high

occurrence of this aspect (mentioned by 12 out of 32, or 38%), I created a market access variable as described in the methodology and I analyzed it in comparison to the other variables. This market access data will be further discussed in the third section of the analysis. Issues mentioned by four or fewer interviewees included burden of medical expenses, lack of transportation, environmental factors, burden of debts, inadequate production, lack of land, and a state of feeling tired or done ("taabane" in Arabic).

The other commonly mentioned issues of financial resources and animal resources can perhaps be addressed together as household resources. Participants described this lack of household resources as a key reason for food insecurity, specifically household experience of hunger in the past year.

Within the category of animals for production, the issue specifically had to do with decisions to sell the animals, regret for selling the animals, desire to own more animals (specifically goats and cows), the sense that the animals owned are not sufficient for production of dairy products for sale and household consumption, the fact that many animals have died (one participant reported that 17 goat kids died in the past year, another participant reported that a cow died), and animals have been stolen from two participants.

Within the category of marketing and lack of demand the specific issues cited include: a lack of market, the high cost of accessing a good market, a desire for more places to sell products, desire for someone to assist by marketing products, the desire to open a store or sell in another area of Jordan, only selling to neighbors, at a "dukan" (small convenience store), and from the home (one interviewee), the burden of the up-front cost of available markets, the lack of success in informal markets, the markets are too few and not big enough, the lack of markets for these products specifically, and sheep and goat products specifically (one interviewee).

Table 2: Food security related issues mentioned by participants and frequency

Market access related comment	Occurrence	Share of Total
I need a better (or more or bigger) market for products	8	25%
I need help with marketing	1	3.1%
I want to open a store, or another store	2	6.3%
The market for these (dairy "mouneh") produ lacking. Need to export.	1	3.1%

Additionally, although these categories of issues mentioned by participants as reasons for food insecurity were initially separate, the stated issues of 1) burden of debts and 2) the lack of finances when aggregated represent 12 out of the 32 participants (37.5%). Specifically, participants mentioned lack of money to buy food, and one interviewee stated that producing dairy products is expensive.

C. Nutrition

1. Nutrition security

Malnutrition, as mentioned in the literature review, is a multi-faceted, global problem. This section describes how the data answers the question: "How does 'mouneh' production impact household nutrition in Jordan?"

This discussion will begin with a description of the health benefits of dairy consumption. The milk produced by cows, goats, and sheep differ in vitamin and nutrient content, and "mouneh" can be produced from milk from any animal source. However, for rural areas in Jordan, rural families can more easily afford sheep and goats than cows, and if production occurs on a small, household-scale, it can still be profitable with a few small ruminants. Most interviewees referred to owning goats and sheep more than owning cows. Moreover, goat and

sheep milk have significant benefits over cow milk, which has implications for “mouneh” products addressing vitamin and mineral deficiencies among rural populations.

Table 3: Vitamin, mineral, and nutrient contents of cow, goat, and sheep milk

Parameter	**Cow milk**	**Goat milk**	**Sheep milk**
Protein (g/100g)	3.4 0.1	3.7 0.1	5.5 1.1
Fat (g/100g)	3.3 0.2	3.8 0.1	5.9 0.3
Vitamin A (µgRE/100g)	37.0 8.0	54.3 0.0	64.0 5.5
Calcium (mg/100g)	112.0 14.5	130 4.0	197.5 2.5
Magnesium (mg/100g)	11.0 0.5	14.5 1.5	19.5 3.0
Phosphorus (mg/100g)	91.0 5.5	109 12.0	141.0 1.7
Potassium (mg/100g)	145.0 11.5	185.5 4.5	138.0 2.0
Sodium (mg/100g)	42.0 6.5	39.5 1.5	39.0 7.0

(Balthazar, et al., 2017)

Table 3 above describes nutrients, vitamins, and minerals in cow, goat, and sheep milk. This table includes specific nutrients, vitamins, and minerals which are more represented in goat and sheep milk than cow milk, with the exception of sodium, of which cow milk has the highest amount (Balthazar, et al., 2017). The comparisons presented in this table show the nutritional benefits of consuming goat and sheep milk. Since goats and sheep produce milk on a seasonal basis, methods of preserving milk for year-round consumption makes these nutrients further accessible to rural populations. Accessibility is high for those households that own animals and produce dairy “mouneh” products, but accessibility is also increased for households consuming dairy “mouneh” when producers are able to and choose to sell their product in markets.

Protein deficiency has been addressed by introducing dairy or increasing dairy in the diet. Whitsett-Morrow et al (2016) write about protein sources in food aid. In developing food aid, a key consideration is the nutritional content compared to the cost of the ingredient or item. Dairy

was found to be more expensive than other protein sources (for example plant sources) but because the protein available was of a higher quality, less was needed to make the desired nutritional contribution, so food aid developers preferred dairy source protein. Additionally, for the research done by Whitsett-Morrow et al, the Digestible Indispensable Amino Acid Score (DIAAS), a protein quality assessment tool developed and implemented by the FAO, found that dairy proteins are superior than other proteins used in food aid products (Whitsett-Morrow & LaGrange, 2016). Although the context of this research is not food aid or development of food aid, the cost-benefit dimension of protein from dairy is relevant to rural household members who must decide how to purchase sufficient nutritious food for his/her family.

Beyond comparing dairy protein to plant proteins, dairy-source protein can also be compared to other animal-based proteins common in Jordan and in MENA such as chicken, beef, lamb, and processed meats. The table below presents a price comparison per kg of these protein sources. It should be noted that meats and dairy products are consumed differently in the diet, in different forms and amounts. In the MENA it is common to consume dairy-source "labneh" in the morning but not common to consume meat in the morning. However, a price comparison still demonstrates the potential of dairy for providing more protein per unit cost in Jordanian dinars (JD).

Table 4: Price comparison of protein sources in Jordan

	Beef	Chicke	Lamb	Milk	Labne	Shanina	Laba
Price (JD/kg)	8.1	4.3	7.0	1.1	5.6	0.6	1.3

(Department of Statistics of Jordan 2013)

Table 4 shows that dairy products are, overall, a cheaper source of animal protein than meats. This is significant for rural households relying on smaller incomes and households with many mouths to feed. The household member acquiring and preparing the food must make decisions that maximize protein and general nutrient consumption and that ensure that the other household members do not go hungry.

Every participant interviewed stated that their household consumes some amount of the products they produce on a weekly basis. This indicates that these products play a regular and potentially significant role in the household diet, regardless of the quantity consumed per household or per individual household member. Additionally, every participant interviewed stated an amount that their household sells from what they produce on a weekly or monthly basis. Therefore, these products also play a regular role in the weekly and monthly income of the household, regardless of the amount sold.

The nutrition security factor can be observed in this way: nutrition insecurity can be an effect of low production, low consumption, low sales, low profit, and/or low market access. Since nutrition security has to do with individual nutrient intake, other data that can answer the question of nutrition security among Jordanian "mouneh"-producing households include per person expenditure on food, per person expenditure on fruit, and per-person consumption of household-produced dairy products.

Table 5 shows the average and standard deviation of dairy product production within food insecure and food secure households. This data is further presented in a box plot (Figure 3).

Table 5: Kilograms of household-produced dairy products produced per week per member of household

	Food insecure households	**Food secure households**
Average	8.54	4.45
Standard deviation	14.6	3.86

Figure 3: Production (kg/week) per household member of food secure and food insecure households

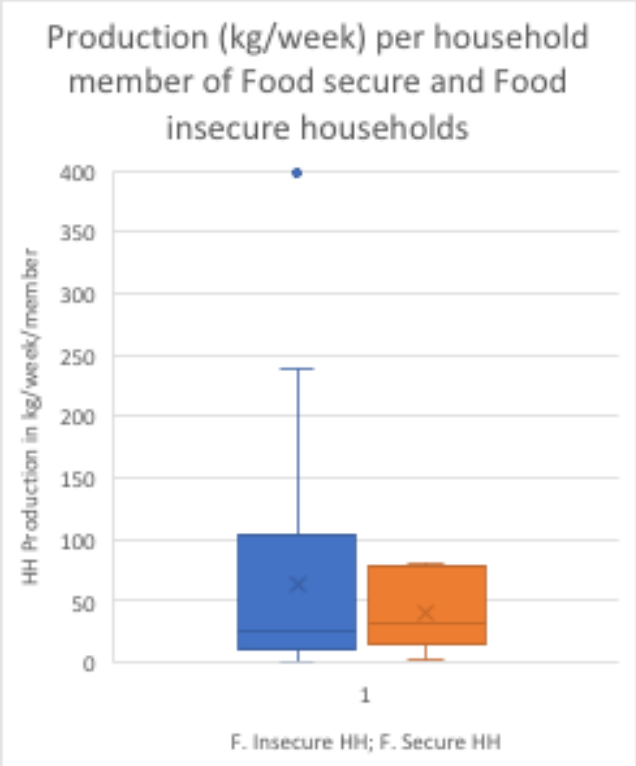


Figure 3 and Table 5 above show the average and standard deviation of production for food insecure and food secure households. Self-perceived food insecure households show a higher average and standard deviation, therefore a wider range, than food secure households. This indicates higher reliance on household produced products for food insecure households compared to food secure households. The nature of the reliance, whether through consumption

or sales of the product for profit, is unclear. It also indicates a wide variation among food insecure households of production of household-produced products. Some food insecure households barely rely on household-produced products, while others rely on them significantly.

This data on production in kilograms per week per household member reveals a few things. The food insecure households have a higher mean production than the food secure households. The food insecure households also have higher values for production and a wider range of production than the food secure households. These results could indicate that food insecure households rely on household-level food production more than food secure households do, for consumption and/or livelihoods. This would indicate that "mouneh" production plays a more significant role in the nutrition and/or livelihoods of households identifying as food insecure than households identifying as food secure, but production does not indicate specifically whether the significance would be in nutrition or livelihood or both.

2. Consumption

Figure 4: Individual consumption of household produced dairy products in kg per week

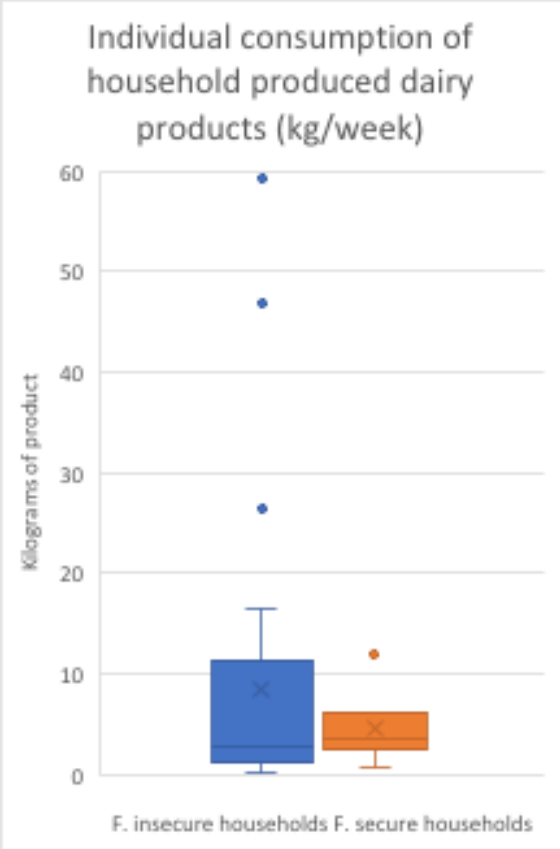


Figure 4 above shows that self-perceived food insecure households consume higher amounts of household-produced dairy products than self-perceived food secure households. The mean consumption of the food insecure household members is reported to be 8.54 kg per household member while the mean of the food secure households is 4.45 kg per household member. There are also a few anomalies for each group, but these support the notion that food insecure households consume more household-level produced dairy foods than food secure households.

This finding has significant implications for household food security: those households which experience hunger and food insecurity report a range of consumption of household products, but generally higher than those of food secure households. This points to the significance of household production as a source of available, accessible, and nutritious food during difficult, food-insecure times. It must also be noted that the range of individual consumption of household products is very wide for the food insecure households; however, households also produce a wide range of amounts of product, based on the number of animals and other factors.

Table 6: Consumption (kg/week) of specific mouneh products in total, by household, by individual, and by food security experience

Product consume	**Food secu total**	**Food insecu total**	**Food secure, household**	**Food insecure, household**	**Food secure person**	**Food insecu person**
Labneh	22.5	96.5	3.8	0.3	3.7	0.6
Samneh	8.5	22.1	1.4	0.1	0.8	0.1
Jameed	2.5	27.5	0.4	0.0	1.1	0.2
Butter (zibdeh)	5.5	34.0	0.9	0.1	1.3	0.2
Cheese (jebneh)	41.0	133.0	6.8	0.6	5.1	0.8
Laban	69.0	234.0	11.5	1.0	9.0	1.4
Shaninah	60.0	375.0	10.0	0.9	14.4	2.3
Kishik	1.0	13.5	0.2	0.0	0.5	0.1
Milk	40.0	126.0	6.7	0.6	4.8	0.8

Table 6 above presents the product-specific amounts of each product consumed per household, per individual, and in total, by both the food secure households and the food insecure households. It can be noted that “laban” and “shaninah” were reported to be the products most consumed by weight overall. Cheese and milk follow in consumption volumes. Laban is the product most consumed by food secure households while “shaninah” is the product most consumed by food insecure households.

Additionally, looking at both the household-level values and the household member-level values, food secure households consumed more gross amounts of products than food insecure households. This observation could indicate that "mouneh" plays a more significant role in food secure households than food insecure households, as far as amounts consumed per person and per household.

Table 7: Individual-level consumption of household products (kg/week)

	Average dairy consumption		
	Tota	Per household	Per perso
Food secure households	250.0	41.67	3.68
Food insecure households	1061.	40.83	6.55

The level of nutrition security can be extrapolated from household consumption of products produced, household spending on food, and household spending on fruit. Additionally, nutrition security can partly be discerned from the level of market access.

Laban and "shaninah" are the most consumed products by weight, with "shaninah" significantly in the lead, and cheese and milk following closely after by volume of consumption frequency. Laban is the product most consumed by food secure households while "shaninah" is the product most consumed by food insecure households.

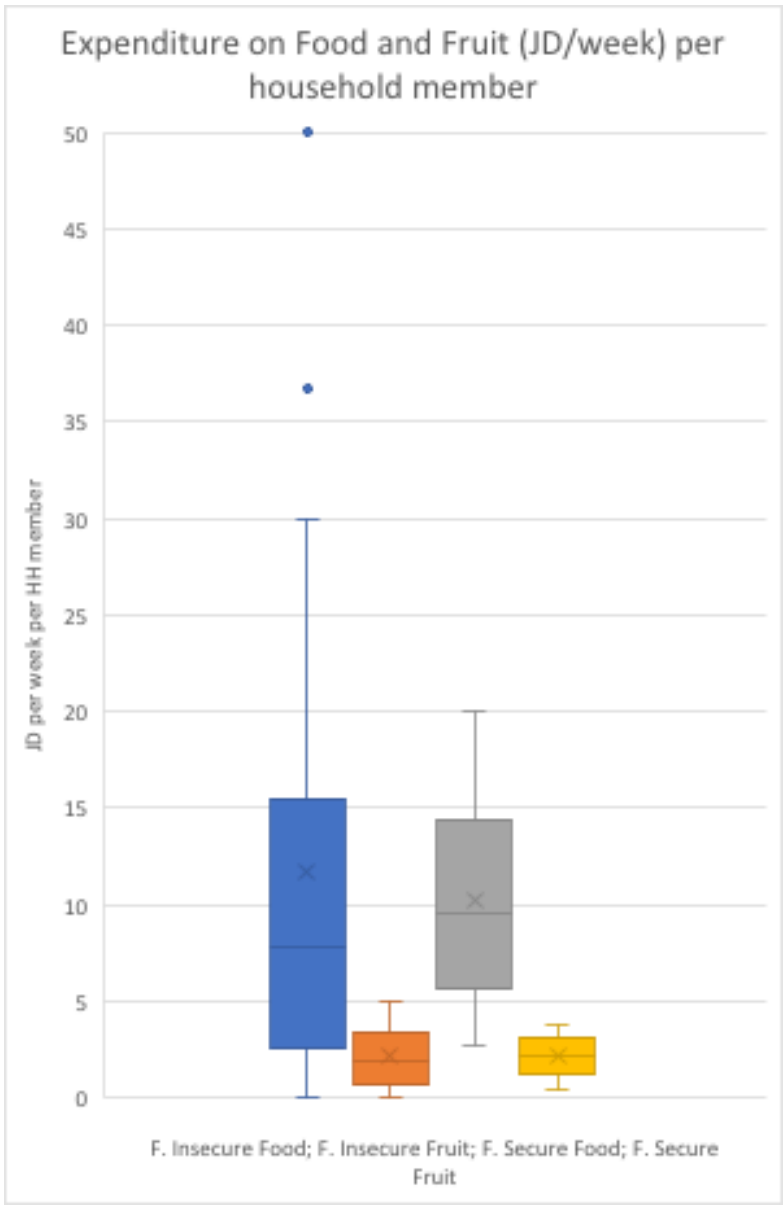
From Table 7 above, we can observe that food insecure households have almost twice the per person weekly dairy consumption as food secure households. The household-level values are about the same for food secure and insecure households, but since many food secure households have fewer members than food insecure households, the per person measurements give a fuller picture of the situation. Additionally, it can be argued that both 3.68 kg/week per household

member for food secure households and 6.55 kg/week per household member for food insecure households indicate that dairy “mouneh” play a key role in the lives of producing households. However, “mouneh” has a more significant role in food insecure producing households than those that are food secure.

Since these items being consumed are dairy products, this data from Table 7 may indicate a higher protein intake among those who experience food insecurity, however more data needs to be collected on each household’s diet to determine a total protein or calorie intake.

Looking generally at consumption and production, it should be noted that the production and consumption tables are not exactly the same. There is one instance of a participant consuming an item she did not produce (participant 1 consumed ¼ kg of “jameed” per week that she did not produce). There was one participant who produced three products (“samneh,” “jameed,” and “jebneh”) of which she reported that her household did not consume any of these products.

Figure 5: Expenditure on Food and Fruit (JD/week) per household member



Next, we consider per capita food expenditures among participating households, and compare results across food secure and food insecure households. The survey participant was asked to estimate money spent weekly at the household level on food and fruit, and this value was then divided by the number of household members to arrive at a value for per capita

spending on food and fruit. Overall, it can be seen from the data in Figure 5 that households which identify as food insecure do not differ greatly in their spending on food and fruit. Surprisingly, a few households that identify as food insecure spend significantly more on food than households identifying as food secure. The most spent on food per week by a food secure household (per member) is 20 JD; however, some food insecure households spend 30, 37, and 50 JD per household member per week.

This data collected is not related to production of "mouneh" products; it is a question to the participant to estimate money spent weekly at the household level on food and fruit, as income spent on fruit can indicate diet diversity, and income spent on food can indicate dependence on household production and dependence on income and market sources for diet quantity. This value is then divided by the number of household members to arrive at a value for individual spending on food and fruit.

3. Protein security

The term "protein security" can be used more confidently in this study than nutrition security, since the study focuses on dairy products, which are a significant source of protein and the cheapest source of animal protein (Alqaisi et al, 2010). The level of protein security of households can be extrapolated from household consumption of products produced.

Table 8: Diversity of dairy production

Number of Different Produ Produced	Number of Interviewees	Share of Total
1-2	15	46.9%
3-4	5	15.6%
5-6	10	31.3%
7-8	2	6.3%

These results in Table 8 show the number of interviewees that produced different numbers of products. While 46.9% of households produce only one or two types of dairy products, another 31.3% of households produce five or six types. The remaining households reported that they produced only three or four types of dairy products (15.6%), or as many as seven or eight types (6.3%). These results could be explained by 1) an observation that those who produced dairy products usually produced many, and 2) an observation that some subjects did not want to spend much time, so only discussed one or two products. Specifically, those at the market with less success were more suspicious of the research team than those without direct access to market, because I was able to form a relationship with the lady who acted as proxy and gained some trust in this way.

Nutrition analysis is key to addressing the research question, "How does traditional household-level dairy production impact household-level food security, nutrition, and livelihoods?" The nutrition security of households that are food-processing and the individuals within them is directly impacted by the kind and amount of foods produced by these households, as well as the profit made from selling these products which can impact expenditure on food for household consumption. The nutrition security of households can also be inferred not only by these variables (product produced, expenditure on food, expenditure on fruit, household

consumption of the products, profit) by also by other variables including: meals per day and food insecurity. The data should also be analyzed at both the household level and the individual level (as a mean, taken by dividing the household value by number of household members), which can be done in all variables except meals per day and food insecurity.

Nutrition analysis of the data from these 32 households requires converting some household level information into individual level information, since the reported size of the sample of 32 households ranges from 2 to 20 members, differing by a factor of 10.

Table 9: Expenditure on food and on fruit in total, by household, and by individual (JD/week)

	Expenditure on food (JD/weel	Expenditure on fruit (JD/week				
	Total	Per household	Per person	Total	Per household	Per person
Food Secure	600	100	8.82	126.5	21.08	1.86
Food Insecure	1525	58.65	9.41	304	11.69	1.88

It seems from looking at these variables in Table 9, specifically spending on food and fruit per member of household, that there is little difference between food secure households and food insecure households. Food insecure households have slightly higher values for per person expenditures; however, there is very little difference between food insecure and food secure households with regard to spending on fruit per person. Expenditure on food and expenditure on fruit of the households that have not experienced food insecurity are nearly double that of the households that have experienced food insecurity. This is an outcome that was not expected, as food insecure households would be predicted to spend on food items that are cheaper than fruit. They would also be predicted to spend less on food overall than food secure households, if they rely on their production for their diet. However, this may indicate that food insecure households rely on their production more for sales than for nutrition.

Table 10: Average number of meals consumed per person per day

	Meals consumed per day (average)
Food secure households	3.00
Food insecure households	2.54

The data in Table 10 shows that the households that have experienced food insecurity in the last year eat 2.54 meals per day on average, while those that have not experienced food insecurity eat 3 meals per day. Therefore, the data on meals per day aligns with this variable, as those who experience greater food security can be assumed to be more apt to eat fewer meals per day as a household.

D. Livelihoods and food sovereignty

1. Food sovereignty

This section describes how the data answers the question: "How does 'mouneh' production impact food sovereignty of households in Jordan?" Food sovereignty can be seen as the missing piece in the food security dialogue. Although food sovereignty is present in the food security dialogue, it is not yet prominent as a preferred method of approaching food security. However, the concept of food sovereignty is relevant in discussions around rural food producers, and specifically producers and sellers of traditional foods in Jordan. Rural Jordanians are putting action to the theory of food sovereignty by exercising their rights to produce traditional foods, as taught by their elders and ancestors. They are going even further in exercising these rights and promoting the rights of consumers by selling their product in markets, increasing accessibility of traditional foods to non-producers who otherwise would not have access. This picture of active food sovereignty also fits into normal, healthy market activities – producers do not exercise their

rights by recklessly producing traditional foods, but by taking care in hygiene and food safety as they are able and to the extent that this matters to their consumers – a picture of supply and demand and healthy competition in markets.

It is also important to consider the role of nutrition and protein in food sovereignty in the context of this research. This research has a context of animal protein and animal fat foods, plus "kishik" (a mixture of dairy and grains). Therefore, the continued and sustainable production of these traditional preserved dairy products relates more directly to protein security than the broader nutrition and food security. These practices create availability and accessibility of animal proteins to the producing households and to the consumers which can be accessed by these households through markets and trade. Since dairy is the cheapest animal protein available and has vitamins and minerals including vitamin A and Calcium, rural households benefit greatly from the direct (high) access and availability to this, as far as nutritional needs of the household.

The concept of food sovereignty, a rights-based approach to food security, must be reconciled with market and sustainable livelihood activities. By engagement in market activities and in creating livelihoods, people can take hold of their rights to produce what they wish. Inasmuch as producers choose to sell and not only consume the entirety of their production within their household, market activities and livelihoods support the food sovereignty of both producers and consumers to produce and consume the products they prefer, in the way they prefer. In terms of the pillars of food security, market engagement and livelihood activities allow for greater availability and accessibility of traditional household-level produced foods. Therefore, market engagement is an essential component of food and nutrition security and a key tool in maintaining food sovereignty of both producers and consumers. Livelihoods cannot exist

apart from the market and trade; therefore, sustainable livelihoods are also critical to food and nutrition security as well as the exercising of food sovereignty.

The development of the dairy industry has an impact on small-scale dairy production. The population is centralized, as is dairy production and distribution. The dairy products that are part of the Western diet and consumed frequently and in large quantities are available cheaply in centralized markets (supermarkets and corner markets) while traditional products are further removed from the majority of the population. Traditional products produced in rural areas tend to have less access to food safety tools and less opportunity for marketing, making them less competitive compared to commercially produced dairy products (not including dairy products that are not commercially produced). Therefore, there is mainly demand for only the very unique traditional products from small-scale and rural producers.

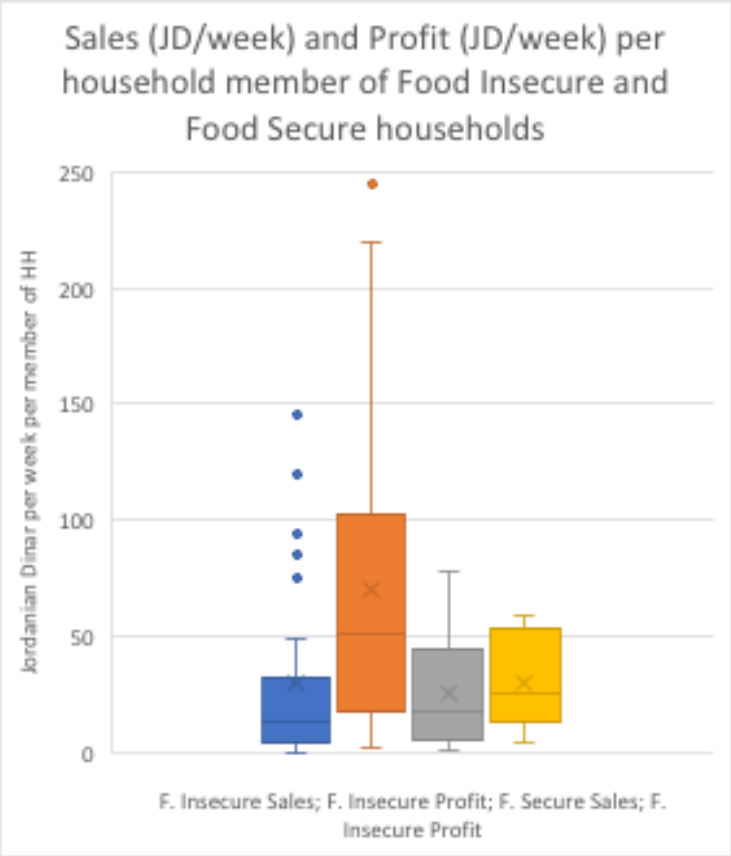
Traditional dairy products produced, consumed, and sold in Jordan range from products that fit a Western diet: butter, milk, plain yogurt, and cheese; to products that are uniquely Arab or Bedouin: Sheep fat shortening “samneh”, sheep butter “zibdeh”, “shanineh,” “jameed,” “labneh,” “laban,” milk, cheese “jebneh,” and “kishik.” The nine products were included in this study because they were mentioned by participants as the main products they produce.

2. Livelihoods

As discussed previously, sustainable livelihoods are essential to long-term food security for rural populations, and market and trade activities and access are essential to sustainable livelihoods. The data used to answer the research question includes production, consumption, profit, sales, and a market access variable I created.

The production, consumption, sales, profit, and food and fruit expenditure were converted from continuous variables into categorical variables, using the categories “low” “medium” and “high,” in order to carry out meaningful Fisher’s exact test for p-values showing significance in relationships between these variables and the market access variable.

Figure 6: Sales (JD/week) and Profit (JD/week) from sales of dairy “mouneh” per household member of food insecure and food secure households



This data in Figure 6 shows that food insecure households have a higher mean for sales and for profit than food secure households. The food insecure household data shows a few

anomaly-like values that are much higher than that of food secure households. While there is little difference in the middle quadrants representing sales, there is great difference in the data on profit of food insecure and food secure households. The mean profit per member of food insecure households is more than double the mean profit per member of food secure households. The highest value for the food secure household's profit is below the mean of the mean profit for food insecure households.

This data shows that, especially as far as profit is concerned, "mouneh" plays a more significant role in those households identifying as food insecure than those identifying as food secure.

3. The market access variable

The market access variable was created in response to reporting from participants of key factors that influenced their level of food security. Market access was an issue mentioned by several participants as a barrier to food security (see page 43 and Table 1 on page 42). This variable categorized the responses into three groups: direct access to active markets, indirect access to markets, and direct access to inactive markets. Respondents were placed into these groups based on their current presence or absence in markets, their products' presence or absence in markets, and the kinds of markets they chose to sell in.

Upon beginning interviews, I intentionally recruited interlocutors and participants with different levels of access to different kinds of markets. Some interlocutors and participants were found at productive, successful, formal, legal markets, while others sold more irregularly, at markets that were not formal or legal, and still others sold solely to neighbors and members of their community. This grouping that I made upon interviewing is based on the interviewee's

access to the market in terms of the vibrancy of the market and degrees of relationship to the market. The "low" category includes those with access to a market with less vibrancy, or perhaps illegal markets with no down-payment required for participation, one which the police can shut down at any point. The "medium" category includes those with access to vibrant, formal, organized markets by proxy, through relationship with another individual willing to transport and sell their products. Participants who personally sold their products in markets with high demand, and who had the financial ability to pay the weekly down-payment, were categorized as having "high" market access.

Below, the participants in these categories of "low" "medium" and "high" market access will be compared regarding their household- and individual-level production, consumption, and profit.

Table 11: Comparing production, consumption, and profit with market access

		Direct to inactive markets	Indirect	Direct to active markets
Production (kg/week)	Total	4560.5	6110	500.6
	Per household	350.81	509.17	71.51
	Per person	48.52	89.85	7.36
Consumption (kg/week)	Total	253	957.83	100.75
	Per household	19.46	79.82	14.39
	Per person	2.69	14.09	1.48
Profit (JD/week)	Total	3718.5	6045.2	915
	Per household	286.04	503.77	130.71
	Per person	39.56	88.9	13.46

As displayed in Table 11, this data shows that those with indirect market access have much higher per person production, consumption, and profit with respect to household-produced dairy products. This indicates that perhaps the qualities of the indirect access group are the most

beneficial to producers insofar as this group shows higher production and consumption of dairy "mouneh" and profit from them. This data in Table 11 could also indicate that the direct access categories of market access have additional costs significant enough to limit success in markets. One possible explanation is that households with higher food security are less involved in and reliant on "mouneh" production, consumption, and sales than households with lower food security. Another is that indirect access through an intermediary to vibrant markets renders more benefit than direct access to less vibrant markets.

The expenditure on food, expenditure on fruit, sales, profit, consumption, and production variables were converted from continuous variables into categorical variables by arranging each of the respective values given by participants in order from lowest to highest. Then, the results were divided into thirds (3 nearly-equal groups of 11, 11, and 10) and assigned the value "Low" to the 11 participants with the lowest values, "High" to the 10 participants with the highest values, and "Medium" to the 11 participants in the middle. These categorical variables were tabulated to the market access variable and the p-values were found using the Fisher's exact calculation. Specifically, the volumes of production (kg/week) and consumption (kg/week) as well as the amounts in Jordanian dinars (JD/week) of sales, profit, and expenditure on food and fruits were tabulated against the 3-category market access variable. STATA software was used, and the Fisher's exact test was used due to the small sample size, for greater accuracy of the p-values. The p-values revealing significance (less than 0.05) are noted by an asterisk.

Table 12: P-values (Fisher's exact) for Market Access variables

	Market Access
Production	0.011*
Consumption	0.007*
Sales	0.045*
Profit	0.002*
Expenditure on fruit	0.330
Expenditure on food	0.971

*: p value 0.05

Comparing the market access variable with the production, consumption, sales, profit, and expenditure variables in Table 12, significance is observed in relationships with production, consumption, profit, and sales. These results indicate that profit, consumption, and production may have a significant relationship with the level of market access held by Jordanian household-level dairy producers. However, the Fisher's test indicates correlation only, and more research is required to determine the nature of these relationships, that is, whether Profit, Consumption, and Production have a causal relationship with the market access variable. The expected outcome of these tabulations between these variables is significance as far as higher production leading to higher or more successful market access, higher consumption perhaps leading to lower market access or lower market activity, high market access leading to higher sales and profit, and high expenditure on food and fruit being correlated with higher market access. These outcomes were expected because households consuming more from household production would be assumed to rely less on the market for food expenditure, while households consuming more from market purchases would be expected to rely more on the market as a source of food and less on household production.

These observations indicate that the interviewee's level of market access could directly impact how much dairy product his/her household sells, or vice versa. Significance is observed in relationships between market access and the four aforementioned variables. Significance is

not observed in the relationships between market access and perceived food insecurity, expenditure on food, or expenditure on fruit. More research is necessary to determine the nature of the significance observed in these p-values.

Significance was observed in the relationship between Market Access and Production, Consumption, and Profit. This shows that the market access variable could have an impact on the food production, food consumption, and profit of these groups. However, significance was not observed in the remaining categories.

CHAPTER IV

DISCUSSION

A. Household food security

Returning to the presentation of data from the Department of Statistics of Jordan, a few assumptions can be made. Household level production of these dairy "mouneh" products may be decreasing as commercial production of these items increases, and there could be a causal relationship between these. Commercial products may be becoming more affordable, available, and accessible in more areas of Jordan than those products produced by traditional methods in the home. It is possible that, although a less of these items are being produced for household consumption, more are being produced for sale.

The results presented above show that there is significance in the relationship between market access and production, consumption, sales, and profit of household level produced traditional dairy products in Jordan. This is in keeping with was expected, in that access to markets and success in selling products (sales and profit) leads to further production of products. Significance in the relationship between market access and consumption of dairy "mouneh" was expected in that productive and profitable market access could decrease consumption of products that would be redirected toward sales, unless production increased with successful market experience and consumption remained stable. Significance was also expected in the relationship between market access and sales and profit, in that successful market access would be expected to correlate with high sales and profit. It was not expected that those households with indirect access to markets would have the highest production, consumption, sales, and profit. However,

looking more closely at the aspects included in indirect market access, reasons for this can be seen. The cost of transportation and cost of participating in active markets could be eliminated if products were sold indirectly through an intermediary.

Families self-identifying as food insecure rely more heavily on household consumption of household-produced dairy products than households self-identifying as food secure. This outcome was expected. Households which struggled to provide for nutritional and other household needs often do so because of lack of financial resources more than lack of food production. Therefore, it is expected that food insecure households would rely more heavily on household consumption of dairy "mouneh" and less heavily on financial resources, while food secure households would do the opposite. Given this difficult situation of food insecure households in Jordan, "mouneh" production makes a positive contribution to food, nutrition, and protein security of these households, and stands in between these households and more extreme food insecurity as a kind of buffer.

Production of household level traditional dairy foods plays a significant role in household food security, and this is somehow related not only to household consumption of products but to sale of products: to the ability or propensity to both consume and sell and make a profit on these products. Therefore, there are at least two dimensions to the role of traditional dairy food production in household food, nutrition, and protein security.

The data in Table 10 was collected on meals per day consumed by the household because it can be a cultural norm for the lower class to eat one large meal together as a household, usually a large plate of rice with bits of meat, vegetables, and sometimes nuts, and with household members eating a pie-slice part out of it. However, it is possible that the way this question was asked, "how many times does your household eat per day", is not very conducive wording, or

perhaps this is just not a concept that is common to talk about or think about. In western culture we are trained and educated to eat three meals per day, but perhaps in Jordan and other areas with different or lack of health education, it is more common to think simply in terms of feeding household members when they are hungry and until they are full.

B. Nutrition

The data collected on consumption of household-produced dairy "mouneh" products address the question of nutritional impact of these products on these households. Meaning can be extrapolated from this data in the sense that the nutritional value of individual products has been determined from specific studies, data which can be added to the amounts of these products consumed by households, along with income spent on both food in general and fruit specifically.

Table 3 demonstrates a few of the many benefits of consuming goat and sheep milk, and by extension the products made from these. This reveals that dairy "mouneh" products play a role in providing specific nutrients to households. Moreover, Figure 3 shows that households identifying as food insecure produce more dairy "mouneh" products. Although there is no evidence of causation, it is an interesting observation that, of the households represented by the participants interviewed, households identifying as food insecure choose to produce more "mouneh" than households identifying as food secure. This could indicate higher reliance on production for nutrition and/or livelihoods. Similarly, Figure 4 shows a higher consumption of household-level produced dairy "mouneh" for individuals within food insecure households than those in food secure households. Both Figure 2 and Figure 4 indicate that "mouneh" play a more significant role in food insecure households than food secure households with regard to both production and consumption. More research is needed in order to gather data on the nature of

the significance of the role of “mouneh” in the nutrition and livelihoods of food insecure households in Jordan. However, some possible explanations for the more significant role of “mouneh” and greater dependence on it of food insecure households include 1) higher reliance on “mouneh” as a source of nutritious food for personal consumption, 2) higher reliance on “mouneh” as a source of income, 3) the choice to invest in “mouneh” production, 4) the necessity of producing “mouneh” as a source of food and income. These potential explanations lead us to a discussion on food sovereignty.

C. Food sovereignty

Producing households who sell “mouneh” exercise their right to food sovereignty as they produce their product(s) in the way they choose for their own consumption and for their sales. Additionally, the state of producers selling their products provides non-producing and urban populations opportunities to exercise the right to access and consume these products which they would otherwise not have access to.

Table 11 described households with direct access to active markets, indirect access to markets, and direct access to inactive markets, and compared their levels of production, consumption, and profit. At the individual level, members of households with indirect market access produced the most, consumed the most, and profited the most from “mouneh” sales. The indirect access category of market access was defined by participants who did not sell their products at a market themselves but used a contact who transported and sold their products for them at markets with high demand. Households were categorized as having direct access to inactive markets when they only sold their products at markets with low demand, while households which sold their products at markets with high demand were categorized as having

direct access to active markets. The interesting finding that households with indirect access to markets have higher production, consumption, and profit per household member paradoxically indicates a high probability of additional barriers or costs for those with direct access to active markets. For example, producers who personally transport their products to a successful market, pay the fee to reserve a table, and spend the day personally selling their product may easily incur more costs than producers who have connections with others willing to transport their product, pay to reserve a table, and spend the day selling. The participants who had connections to someone willing to sell their products for them were connected to a "jemaaiye," or a local neighborhood organization, designed to support women and the community holistically, including offering services for those producing dairy "mouneh." These organizations seem to minimize the costs associated with the role of "mouneh" in livelihoods; however, more research is needed to determine other aspects of market access and how these impact household producers.

This research has revealed some limitations of food sovereignty as a framework. While there is evidence from the issues mentioned with regard to food security by participants (Table 1) that participants did exercise their right and sovereignty to produce and sell these products, there is also evidence from the same data that participation in these activities is a result of desperation or necessity. Comments that show the desire of participants to produce and sell include the desire for help with marketing in order to increase sales (mentioned by 12 out of 32, or 37.5%) and the desire for more animals in order to produce more product (mentioned by 13 out of 32, or 40.6%). Comments revealing the desire of participants to stop producing and selling, and revealing that they see no other option to providing for their family, are namely those participants who reported that they are tired or done producing (mentioned by 4 out of 32, or 12.5%) and

those who mentioned inadequate human resources (mentioned by 7 out of 32, or 21.9%) often described that they need help carrying out this work, and have no desire to do it without additional help. There is lack of clarity of whether participants practiced dairy "mouneh" production out of a genuine desire or pride in doing so or out of desperation or compulsion, and food sovereignty as a framework is revealed to be limited in its capacity to distinguish between these, and therefore limited in its effectiveness.

D. Gender observations

Interesting observations were made during data collection about the gender aspect of "mouneh" production, consumption, and sale. Only one participant out of the 32 participants was male. Several interlocuters were male, but those household members most involved in dairy "mouneh" production and even animal husbandry and with knowledge about these things were women. One participant described her regret: due to her age and illness she was unable to take care of her goats any longer, and she had asked her son to take care of them, but he did not. Frustrated, she quickly sold all of her goats, and now does not have a source of goat milk from which to produce, consume, or sell dairy products. Another participant described being robbed of her goats. She was at home, watching it happen, but was powerless to stop the men who robbed her. Both of these participants, when asked their perception of the reason for their food insecurity, described the need for men to help them, not only in food production but in animal husbandry and other aspects of the "mouneh" production chain. These situations can serve to illustrate the unique difficulties women face in "mouneh" production, and the vulnerability they experience as producers, depending on whether their household has able-bodied men willing to assist in the process.

E. Limitations

This research was carefully designed and implemented but is nevertheless subject to limitation. For example, some qualitative factors could have compromised the rigor of data collection. First of all, in one of the informal markets where ten participants were interviewed, many of them were under the impression that the research team was from an agency that could give them assistance or were under the impression that we would purchase products from them and give them financial support. Even though the Consent Form and Invitation Script were explained before carrying out the interview, I observed at the end of the interview that some subjects still wanted compensation. This false expectation could have colored some answers, especially the qualitative question regarding experience of hunger and lack of food in the past year. Some subjects, if they were confused, may have exaggerated their situation in order to receive more aid.

Another limitation was the malleability of the concept of market access – although this concept has many facets, I only noted whether the market seemed active, and whether there was a membership fee to be able to sell in the market. A third limitation was that my interpreters sometimes got tired, and in some instances, they may not have communicated everything to me or the subjects well. Finally, although the plan was that a community leader would take me to the informal market, he was not available, and this limited the data that was accessible because of less trust built between the research team and the subjects.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

In conclusion, it is evident from the data collected that production for household consumption and sales of these traditional dairy “mouneh” products impact the household food security, nutrition, and livelihoods of Jordanian households. Production, consumption, and sales of these products play a more significant role in food insecure households than food secure households, though they play a role in both. Dairy “mouneh” products play a role in household food security and nutrition in several ways. Each participant reported both selling and consuming each item they produced, with the exception of one participant who reported that she did not consume three of the products she produced. Figures 3 and 4 show an increase in dairy “mouneh” production and consumption for the households reporting that they had experienced food insecurity, revealing that these products play a more significant role in the diet of food insecure households and that these households may significantly depend on these products as sources of protein, fat, calories, vitamins, and minerals. This data may also reveal lower dependence on dairy “mouneh” production and consumption of households identifying as food secure.

These dairy “mouneh” products play a significant role in the livelihoods of producing and selling households. Using the theoretical framework of food sovereignty, “mouneh” production is a means of exercising the right of rural households to harness the resources they have to

produce culturally appropriate traditional foods both for their household to consume and to sell for a profit, in order to access other resources for their household.

It is also evident from this research that gender plays a role in self-identified difficulties of female producers, specifically in animal husbandry. Additionally, efforts to invest in smallholder dairy "mouneh" production may have a disproportionate effect on women. As described in the literature, women working in agriculture bear the brunt of this work as unpaid or lower-paid laborers who also care for and maintain their family and household (FAO, 2011) (Assan, 2014). Therefore, initiatives or policies to support female household-level food producers could have a more positive impact on household food and nutrition security and be preferred over more generic initiatives towards empowering small-scale producers (Kotze, 2003).

There are a few avenues for further research on this topic. Further research could explore the nutritional benefits of specific types of dairy "mouneh." Other traditional foods, their production and nutritional content, could be analyzed for significance in livelihoods and diet of rural households. Additionally, different aspects of market access for household-level producers in Jordan and in MENA could be explored. The role of local community organizations could be explored as an avenue of increasing food security through support of household level food production and through support of other activities.

All in all, this research is valuable in shedding light on one of many aspects of household-level food production, and on food security at the household level in rural Jordan. Alongside the efforts that exist working to improve the food security of rural Jordanian households, support of household level production must be considered, as well as support for community organizations which enhance market access for rural producing households. Efforts

could be made towards involving the younger generation in household level food production at any point in the chain, from animal husbandry to market sales. Further nutrition education could encourage both production and purchases of dairy "mouneh" products and potentially many other traditional household-level produced foods.

A few policy recommendations can be made in light of this research. The first recommendation is to encourage the entry of a proxy, gathering "mouneh" produced in rural areas and facing the barriers of transportation, cost of a table, etc., to sell these products in higher quality markets. This would entail cooperatives, people in the rural community of producers gathering and finding the same proxy to transport and sell their goods, fielding this cost together as opposed to bearing the burden household by household.

A second recommendation is to support investment by the government and NGOs in rural producing households could be considered, using the investment of animals. Cheaper sources of goat and sheep feed could be investigated, as this came up many times as a source of stress and pressure on the household's resources. This was beyond the scope of this study, but perhaps natural, self-propagating plant sources for feed would be beneficial and would alleviate some of the cost of maintaining animals, and indirectly improve the household's food security.

Finally, more study is needed to look at the specific nutritional benefits of these traditional foods. Knowledge of the nutritional benefits of traditional foods can support further initiatives in rural community development, and when traditional foods are found to have nutritional value, this can guide efforts towards improving the food security of populations. Knowledge of nutrients, vitamins, and minerals currently in the diet is helpful in discerning which aspects of food insecurity to target in initiatives. In order to do a rigorous nutritional content analysis, chemical labs must be taken. This study did include nutritional content of these

food products though not the exact same food products produced by the participants. Therefore, there could be some discrepancy in fat or protein or sugar content, since different animals are producing the milk and these content amounts in sheep and goat milk even vary throughout the year, according to participant

Institutional Review Board
American University of Beirut
20 JUL 2018
RECEIVED

المقياس العالمي لتجربة انعدام الأمن الغذائي: مقياس الأسرة المعيشية (المصدر: منظمة الأغذية والزراعة)

أولا أود أن أسألك بعض الأسئلة عن الطعام. خلال آخر 12 شهرًا ، كان هناك وقت عندما:

س1	كنت أنت أو غيرك من أفراد أسرتك قلقين من عدم امتلاك ما يكفي من الطعام للأكل بسبب نقص المال أو الموارد الأخرى؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة
س2	ما زلنا نفكر في آخر 12 شهراً ، هل كان هناك وقت كنت فيه أنت أو غيرك من أفراد أسرتك غير قادرين على تناول طعام صحي ومغذٍ بسبب نقص المال أو الموارد الأخرى؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة
س3	هل كان هناك وقت كنت تأكل أنت أو غيرك في أسرتك فقط بعض أنواع الأطعمة بسبب نقص المال أو الموارد الأخرى؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة
س4	هل كان هناك وقت اضطرت فيه أنت أو غيرك من أفراد أسرتك إلى تخطي وجبة لأنه لم يكن هناك ما يكفي من المال أو الموارد الأخرى للحصول على الطعام؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة
س5	ما زلنا نفكر في آخر 12 شهراً ، هل كان هناك وقت كنت تأكل فيه أنت أو الآخرين في أسرتك أقل مما كنت تعتقد أنه يجب عليك بسبب نقص المال أو الموارد الأخرى؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة
س6	هل كان هناك وقت نفد فيه طعامك بسبب نقص المال أو الموارد الأخرى؟	0 1 98 99	لا نعم لا أعلم أرفض الاجابة

Institutional Review Board
American University of Beirut
30 JAN 2019
APPROVED

س7	هل كان هناك وقت تكون فيه أنت أو غيرك من أفراد أسرتك جائعين ولكنك لم تأكل لأنه لم يكن هناك ما يكفي من المال أو الموارد الأخرى للغذاء؟	0 لا 1 نعم 98 لا أعلم 99 أرفض الاجابة
س8	هل كان هناك وقت ذهبت فيه أنت أو غيرك من أفراد أسرتك دون تناول الطعام ليوم كامل بسبب نقص المال أو الموارد الأخرى؟	0 لا 1 نعم 98 لا أعلم 99 أرفض الاجابة

78

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

أسئلة مسح الحفاظ على الأغذية المنزلية:

رقم السؤال	السؤال	الإجابة	ملاحظات
س1	ما المنتج (المنتجات) التي تنتجها أسرتك؟ (حدد كل ما ينطبق)	أ- جميد ب- لبنة ج - منتجات ألبان أخرى د - منتجات الألبان الأخرى	
س2	ما هي كمية الأغذية (منتجاتك) التي تنتجها أسرتك؟ (كيلوجرام أو ليتر)	المنتج: أ: ب: ج: د: أ- سنويا: ب- شهريا: ج -أسبوعيا:	
س3	كم من منتجاتك تستهلك أسرتك ؟ (كيلوجرام أو ليتر)	المنتج: أ: ب: ج: د: أ- سنويا: ب- شهريا: ج -أسبوعيا:	
س4	كم عدد الوجبات التي تستهلكها أسرتك في منتجك (منتجاتك)؟	المنتج: أ: ب: ج: د: أ- في اليوم الواحد: ب- في الأسبوع:	
س5	ما هو إجمالي الدخل الشهري للأسرة؟		
س6	ما هي نفقات الأسرة على الطعام؟	أ- أسبوعيا: ب- شهريا:	
س7	ما هو الربح المادي الذي تحققه من بيع منتجك (منتجاتك)؟	المنتج: أ: ب: ج: د: أ- سنويا: ب- شهريا: ج -أسبوعيا:	

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

Institutional Review Board
American University of Beirut

20 JUL 2018

RECEIVED

أداة المسح لحفظ الاغذية

تاريخ:_____

رقم المقابلة:_____

عدد أفراد الأسرة:_____

التفاصيل المنزلية: (تشير إلى عدد أفراد الأسرة في كل فئة)

	6-0 اشهر	12-6 اشهر	1- 3 سنة	8-4 سنة	13-9 سنة	18-14 سنة	30-19 سنة	50-31 سنة	70-50 سنة	>71 سنة		
ذكور											حامل	مرضعة
إناثا												

موقع الأسرة (وفق المحافظة):

[عمان] [البلقاء] [الزرقاء] [مادبا] [إربد] [المفرق]

[جرش] [عجلون] [الكرك] [الطفيلة] [معان] [العقبة]

الموافقة المقدمة: [نعم] [لا]

80

Household food preservation Survey Questions:

No.	Question	Answer	Notes
Q1	What product(s) does your household produce? (Select all that apply)	A. Jameed B. Labneh C. Other dairy mouneh: D. Other dairy mouneh:	
Q2	How much of your product(s) does your household produce? (L or kg)	Product: A: B: C: D: A. Annually: B. Monthly: C. Weekly:	
Q3	How much of your product(s) does your household consume? (L or kg)	Product: A: B: C: D: A. Annually: B. Monthly: C. Weekly:	
Q4	At how many meals does your household consume your product(s)?	Product: A: B: C: D: A. Per day: B. Per week:	
Q5	What is the monthly total income of the household?		
Q6	What is the household's expense on food?	A. Weekly: B. Monthly:	
Q7	How much do you make selling your product(s)?	Product: A: B: C: D: A. Annually: B. Monthly: C. Weekly:	

Institutional Review Board
American University of Beirut
30 JAN 2019
APPROVED

Institutional Review Board
American University of Beirut
20 JUL 2018
RECEIVED

Food Preservation survey instrument

Date: _____
Interview number: _____
Number of members in household: _____
Household details: (indicate number of household members in each category)

	0-6mo	6-12mo	1-3y	4-8y	9-13y	14-18y	19-30y	31-50y	50-70y	>70y		
Male											Preg.	Lact.
Female												

Location (governorate) of household:
[Amman] [Balqa] [Zarqa] [Madaba] [Irbid] [Mafraq]
[Jerash] [Ajloun] [Karak] [Tafilah] [Ma'an] [Aqaba]
Consent given:
[Yes] [No]

Institutional Review Board
American University of Beirut
30 JAN 2019
APPROVED

Institutional Review Board
American University of Beirut
20 JUL 2018
RECEIVED

Global Food Insecurity Experience Scale: Household referenced (Source: FAO)

First I would like to ask you some questions about food. During the last 12 MONTHS, was there a time when:

Q1	You or others in your household worried about not having enough food to eat because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused
Q2	Still thinking about the last 12 MONTHS, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused
Q3	Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused
Q4	Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	0 No 1 Yes 98 Don't know 99 Refused
Q5	Still thinking about the last 12 MONTHS, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused
Q6	Was there a time when your household ran out of food because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused
Q7	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	0 No 1 Yes 98 Don't know 99 Refused
Q8	Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	0 No 1 Yes 98 Don't know 99 Refused

Institutional Review Board
American University of Beirut
30 JAN 2019
APPROVED

APPENDIX III

AUB Social & Behavioral Sciences
INVITATION SCRIPT

Invitation to Participate in a Research Study

This notice is for an AUB-IRB Approved Research Study
for Dr. Martin Keulertz and student Hannah Nicholson
at the American University of Beirut

I am asking you for your participation in a research study about household-level dairy preservation (mouneh production) and food security in which I want to document the role of mouneh production and consumption in the nutrition and food security of Jordanian households. The study is called The Role of Mouneh Production in Household Food and Nutrition Security in Jordan.

You are eligible to participate in this research if you are Jordanian (not Syrian), are over the age of 18, and either sell or produce dairy mouneh products (for example, jameed and labaneh).

This research study does not provide any particular participation benefits. The student researcher will be carrying out interviews in a private setting and according to the preference of the participant.

You will be asked to complete two short surveys and to give demographic information. The surveys will ask you to recall what foods you and your family have eaten over the past week and if you or anyone in your family experiences hunger or food shortages. The two surveys will take about 10 minutes each and I invite you to add any additionally comments or explanations of your answers. This research is conducted by AUB. The data will be stored on a password protected computer and the hard copies will be stored at the principle investigator's office in a locked drawer. Data will be stored for at least three years after study completion.

You will also be asked about other vendors/producers who may be interested in participating in the study. Contact information such as phone numbers for these will be requested, however these potential participants' permission to share their numbers with the researcher will be sought prior to recruiting them.

Your participation is voluntary. You may decline to answer any questions you do not wish to answer. In case of any discomfort you may skip questions or the entire survey and there is a referral mechanism. Your name or other identifiers will not be attached to your answers so that your confidentiality can be maintained.

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

Please listen as the consent form is read to you and consider if you would like to participate in the study. If have any questions about this study, now or in the future, you may ask me or contact the investigation research team at any time.

Student Researcher: Hannah Nicholson

hhn07@mail.aub.edu (962) 797509974

Principle Investigator: Dr. Martin Keulertz

mk219@aub.edu.lb (961) 1 350 000 Extension 3086

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

APPENDIX IV

American University of Beirut
الجامعة الأميركية في بيروت

العلوم الاجتماعية والسلوكية

لجنة الأخلاقيات (IRB)

الجامعة الأميركية في بيروت

دعوة للمشاركة في دراسة بحثية

هذا الإشعار لدراسة بحثية معتمدة من الجامعة الأميركية في بيروت- لجنة الأخلاقيات (IRB)

للدكتور مارتن كويلرتز والطالبة هانا نيكلسون

في الجامعة الأمريكية في بيروت

أطلب منكم مشاركتكم في دراسة بحثية حول حفظ الأغذية على مستوى الأسرة (إنتاج المونة) والأمن الغذائي الذي أريد أن أوثق فيه دور إنتاج واستهلاك المونة في التغذية والأمن الغذائي للأسر الأردنية. وتسمى هذه الدراسة "دور إنتاج المونة في أمن الغذاء والتغذية المنزلية في الأردن."

أنت مؤهل للمشاركة في هذا البحث إذا كنت أردنياً (وليس سورياً) ، وتزيد عمرك عن 18 عاماً ، وإما تقوم ببيع أو إنتاج منتجات ألبان منيرة(على سبيل المثال، labaneh و jameed)

لا توفر هذه الدراسة البحثية أي فوائد خاصة للمشاركة. سيقوم الباحث الطالب بإجراء مقابلات في بيئة خاصة ووفقًا لتفضيل المشارك.

سيُطلب منك إكمال استبيانين مختصرين وإعطاء معلومات ديموغرافية. سوف اسألك من خلال الاستبيانين أن تتذكر الأطعمة التي تناولتها أنت وعائلتك خلال الأسبوع الماضي ، وإذا كنت أنت أو أي شخص في عائلتك يعاني من الجوع أو نقص الطعام. سيستغرق كل من الاستبيان حوالي 10 دقائق ، وأدعوك لإضافة أي تعليقات أو توضيحات إضافية لإجاباتك. يتم إجراء هذا البحث من قبل الجامعة الأمريكية في بيروت. سيتم تخزين البيانات على جهاز كمبيوتر محمي بكلمة مرور وسيتم تخزين النسخ المطبوعة في مكتب المحقق الأساسي في درج مغلق. سيتم تخزين البيانات لمدة لا تقل عن ثلاث سنوات بعد الانتهاء من الدراسة.

سيتم سؤالك أيضًا عن البائعين / المنتجين الآخرين الذين قد يرغبون في المشاركة في الدراسة. سيتم طلب معلومات الاتصال مثل أرقام الهواتف لهذه ، ولكن سيتم طلب إذن المشاركين المحتملين لمشاركة أرقامهم مع الباحث قبل دعوتهم.

مشاركتك تطوعية. يمكنك رفض الإجابة عن أي أسئلة لا ترغب في الإجابة عنها في حالة حدوث أي انزعاج يمكنك تخطي الأسئلة أو مسحها بأكملها ، وهناك آلية لإحالتها. لن يتم إرفاق اسمك أو معرفات أخرى بإجاباتك حتى يمكن الحفاظ على سرّيتها.

يرجى الاستماع لقرأة نموذج موافقة لك والنظر فيما إذا كنت ترغب في المشاركة في الدراسة. إذا كان لديك أي أسئلة حول هذه الدراسة ، الآن أو في المستقبل ، يمكنك أن تسألني أو تخدع فريق أبحاث التحقيق في أي وقت.

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

طالب الباحث: هانا نيكلسون

هاتف: (+962)797509974

أو عبر البريد الإلكتروني: hhn07@mail.aub.edu

الباحث الرئيسي: د. مارتن كويلرتز

هاتف: 961.1.350000+ الداخلي الرمز 3086

أو عبر البريد الإلكتروني: martin.keulertz@aub.edu.lb

Institutional Review Board
American University of Beirut

30 JAN 2019

APPROVED

BIBLIOGRAPHY

Ahmed, M. M., Jabbar, M., & Ehui, S. (2000). Household-level economic and nutritional impacts of market-oriented dairy production in the Ethiopian highlands. *Food and Nutrition Bulletin*, 460-465.

Ahmed, U. I., Ying, L., Bashir, M. K., Abid, M., & Zulfiqar, F. (2017). Status and determinants of small farming households' food security and role of market access in enhancing food security in rural Pakistan. *PloS one*, 1-15.

Allen, S., & de Brauw, A. (2018). Nutrition sensitive value chains: Theory, progress, and open questions. *Global Food Security*, 22-28.

Alqaisi, O., Ndambi, O. A., Uddin, M. M., & Hemme, T. (2010). Current situation and the development of the dairy industry in Jordan, Saudi Arabia, and Syria. *Trop Anim Health Prod*, 1063-1071.

Alu'datt, M. H., Al-Rabadi, G. J., Al-Ismail, K. M., Althnaibat, R. M., Ereifej, K., Rababah, T., . . . Torley, P. J. (2015). Characterization and biological properties of dry fermented product (jameed) manufactured from cow milk: comparison of sun and freeze drying. *Journal of Food Processing and Preservation, 39*, 282-291.

Assan, N. (2014). Relevance and feasibility of women's involvement in promoting sustainable food production and security in Southern Africa. *Sustentabilidade em Debate*, 86-97.

Bashir, M. K., & Schilizzi, S. (2013). Determinants of rural household food security: a comparative analysis of African and Asian studies. *J Sci Food Agric*, 1251-1258.

Carletto, C., Zezza, A., & Banerjee, R. (2013). Towards better measurement of household food security: Harmonizing indicators and the role of household surveys. *Global Food Security*, 30-40.

Collins, G. (2018, January 22). Anti-Qatar Embargo Grinds Toward Strategic Failure. *Rice University's Baker Institute for Public Policy Issue Brief*, pp. 1-8.

Department of Statistics of Jordan. (2013). *Household Expenditures & Income Survey - Department of Statistics.* Retrieved 2018 20-March, from dosweb.dos.gov.jo: http://dosweb.dos.gov.jo/economic/household-expenditures-income-survey/

Elhadj, E. (2006). *Experiments in Achieving Water and Food Self-Sufficiency in the Middle East: The Consequences of Contrasting Endowments, Ideologies, and Investment Policies in Saudi Arabia and Syria.* Boca Raton: Elie Elhadj.

FAO. (2008). *Irrigation in the Middle East region in figures: Jordan.* AQUASTAT FAO.

FAO. (2011). *Women in Agriculture: Closing the gender gap for development.* Rome: Food and Agricultural Organization of the United Nations.

Fiedler, J., Lividini, K., Bermudez, O. and Smitz, M. (2012). Household Consumption and Expenditures Surveys (HCES): A primer for food and nutrition analysts in low- and middle-income countries. *Food and Nutrition Bulletin,* [online] 33(3), pp. S170-S184. Available at: http://journals.sagepub.com.proxy.lib.iastate.edu/doi/pdf/10.1177/15648265120333S205 [Accessed 30 Apr. 2018].

Friedmann, H. (2006). New Directions in the Sociology of Global Development From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes. In P. M. Frederick H. Buttel, *New Directions in the Sociology of Global Development* (pp. 227 - 264). Bingley: Emerald Group Publishing Limited.

Gittinger, J. P., Chernick, S., Horenstein, N. R., & Saito, K. (1990). *Household Food Security and the Role of Women.* Washington, D.C.: The World Bank.

Gutner, T. (2002). The political economy of food subsidy reform: the case of Egypt. *Food Policy,* 455-476.

Hilali, M., El-Mayda, E., & Rischkowsky, B. (2011). Characteristics and utilization of sheep and goat milk in the Middle East. *Small Ruminant Research,* 92-101.

Hotz, C., & Gibson, R. S. (2007). Traditional Food-Processing and Preparation Practices to Enhance the Bioavailability of Micronutrients in Plant-Based Diets. *The Journal of Nutrition, 137,* 1097-1100.

Ibnouf, F. O. (2012). The Value of Women's Indigenous Knowledge in Food Processing and Preservation for Achieving Household Food Security in Rural Sudan. *Journal of Food Research,* 238-253.

Ilahi, N. (2000). *The Intra-household ALlocation of Time and Tasks: What Have We Learnt from the Empirical Literature?* The World Bank.

Kerr, R. B. (2016). Indigenous African Knowledge Production: Food Processing Practices among Kenyan Rural Women. *Canadian Journal of African Studies,* 492-494.

Khouri-Dagher, N. (1996). The state, urban households, and management of daily life: Food and social order in Cairo. In D. Singerman, & H. Hoodfar, *Development, Change, and*

Gender in Cairo: A View from the Household (pp. 110-131). Bloomington: Indiana University Press.

Kotze, D. A. (2003). Role of women in the household economy, food production and food security: policy guidelines. *Outlook on Agriculture*, 111-121.

Maestre, M., Poole, N., & Henson, S. (2017). Assessing food value chain pathways, linkages and impacts for better nutrition of vulnerable groups. *Food Policy*, 31-39.

Masamha, B., Uzokwe, V. N., & Thebe, V. (2017). Women's empowerment in traditional food value chains at the micro-level: Evidence from cassava smallholder farming in Tanzania. *Agroecology and Sustainable Food Systems* , [online] 42(1), pp. 28-47. Available at: https://www-tandfonline-com.proxy.lib.iastate.edu/doi/pdf/10.1080/21683565.2017.1325433?needAccess=true [Accessed 31 Mar. 2018].

McGuire, S. (2015). FAO, IFAD, and WFP. The State of Food Insecurity in the World 2015: Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress. *American Society for Nutrition*, 623-624.

Millman, S. (1990). Hunger in the 1980s: Backdrop for policy in the 1990s. *Food Policy*, 277-285.

Moltedo, A., Cafiero, C., & Wanner, N. (2014). Food Security. In A. Moltedo, *Analyzing Food Security Using Household Survey Data: Streamlined analysis with ADePT software.* Washington, D.C.: International Bank for Reconstruction and Development.

Moran, J. (2005). *Tropical dairy farming: Feeding management for small holder dairy farmers in the humid tropics.* Collingwood: Landlinks Press.

Napoli, M. (2011). *Towards a Food Insecurity Multidimensional Index (FIMI).* Rome: Roma Tre University.

Narasimhan, S. M. (2011). *Providing Incentives to Women Farmers for Sustainable Food Production.* Brasilia: International Policy Centre for Inclusive Growth.

Narayana, N. M., & Gupta, V. K. (2013). Effect of total milk solid content adjusted by adding ultrafiltered milk retentate on quality of set mango yoghurt. *International Journal of Dairy Technology*, 570-575.

Nord, M., Satpathy, A. K., Raj, N., Webb, P., & Houser, R. (2002). *Comparing Household Survey-Based Measures of Food Insecurity Across Countries: Case Studies in India, Uganda, and Bangladesh.* Tufts University, Friedman School of Nutrition Science and Policy. Washington, D. C.: Unpublished.

Rababah, T. M., Al-u'datt, M., Al-Mahasneh, M., Yang, W., Feng, H., Ereifej, K., . . . Abu Ishmais, M. (2014). Effect of jam processing and storage on phytochemicals and physiochemical properties of cherry at different temperatures. *Journal of Food Processing and Preservation, 38*, 247-254.

Sadi, M. A. (2014). Marketing trends and future challenges: A review of dairy industry in Saudi Arabia. *International Journal of Dairy Technology*, 459-466.

Sen, A. (1981). *Poverty and Famines: An Essay on Entitlement and Deprivation.* Oxford: Claredion Press.

Smith, L. C., & Subandoro, A. (2007). *Measuring Food Security Using Household Expenditure Surveys.* Washington, D.C.: International Food Policy Research Institute.

Tontisirin, K., Nantel, G., & Bhattacharjee, L. (2002). Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world. *Proceedings of the Nutrition Society*, 243-250.

United Nations Development Programme. (2018). *Sustainable Development Goals*. Retrieved from United Nations Development Programme: http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Wane, N. (2003). Embu women: Food production and traditional knowledge. *Resources for Feminist Research*, 137-148.

Waterbury, J. (1983). *The Egypt of Nasser and Sadat: The Political Economy of Two Regimes.* Princeton: Princeton University Press.

Wilson, R. T. (2017). Traditional milk processing and value-added dairy products in selected Arab countries. *International Journal of Dairy Technology*, 307-319.

World Bank Group. (2016). *Enabling the business of agriculture 2016: Comparing regulatory good practices.* Washington, D.C.: International Bank for Reconstruction and Development.

World Food Summit. (1996).