



Department of Business and Management

International operations and supply chain

**Exploring The Roles and Practices of International Retailers in
Implementing Sustainable Supply Chains to Attain Food Security in
Jordan**

SUPERVISOR

Prof. Behzad Maleki Vishkaei

CO-SUPERVISOR

Prof. Pietro De Giovanni

CANDIDATE

Maryam Raed Alfasisi

ID: 742651

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CHAPTER I

INTRODUCTION, SCOPE, AND OBJECTIVES OF THE RESEARCH

1.1 Background

Around 1.3 billion tons of food are wasted globally each year, which represent approximately one-third of global food production (Amecarelli & Bux, 2021; FAO, 2019; IFRI report, 2019). Also, many studies indicated that retailers have a major influence on the operations of raw material's providers and suppliers as well as on consumer behaviors, which means they can re-shape the upstream and downstream supply chain processes (Cicatiello et al., 2020). Furthermore, studies such as (Pereira et al., 2014; Fuchs et al., 2012; Policy brief, 2017) discussed the importance of retail sector in achieving food security especially in times of conflict, pandemic-related economic shocks, and climate change; while the food supply and agricultural outputs are negatively affected, demand on food items is higher and food prices are rising (FAO, 2011; Torero, 2020).

Therefore, reducing post-harvest food loss has become a global concern and researchers aim to further investigate ways to reduce waste production and turn produced food waste to valuable inputs in the supply chain through adopting more responsible packaging, food surplus redistribution, maximizing resource reuse, recovery, and recycling (Sgarbossa & Russo, 2017; Rivera et al., 2018; Diaz-Ruiz, 2019).

Although different terms are used to investigate supply chain models in relevance to their environmental impact, "sustainable" and "green" supply chain are the most used terms in the recent years (Gurtu et al., 2015) as they provide comprehensive ways to integrate sustainable practices with the context of supply chain management such as implementing the 6R approaches (reduce, reuse, recycle, recover, redesign and remanufacture) or the 5R model (reduction, recycle, reuse, recovery and repair) and the 4R model (Reduce, reuse, recycle and recover) (Kurniawan et al., 2021; Bal & Badurdeen, 2020; O'Conner et al., 2016; Papargyropoulou et al., 2014). Accordingly,

this research presents a 4R model that is more relevant to the food retail sector (Responsible packaging, reduce, redistribution, recycle).

Accordingly, this research seeks to shed lights on the role of implementing sustainable supply chain practices in international food retailers in attaining food security in Jordan.

1.2 Context of the research

The World Bank (2017) classified Jordan as a lower-middle income country, with a population of around 10.5 million (DOS-Jo, 2020). Since it has limited supply of natural resources and agricultural land, and many economic challenges to face such as high poverty rates and unemployment. Jordan has many programs to help overcoming these challenges, such as, the Jordan Economic Growth Plan 2018-2022 (JEGP, 2018).

Jordan is also classified as a food secure country with a score of 8.8 on the (Global hunger index, 2020) which is a 100-point Scale, where zero is the best score (no hunger) and 100 is the worst. Jordan, however, scores 55.2 on an indicator from 0-100 in food availability (GFSI, 2020).

Accordingly, and due to the fact that the Jordanian government in spite of all the efforts, cannot ensure sufficient food supply for the increasing population without international help, many international food-aid organizations such as Action against Hunger and The World Food Program participate in attaining food security in Jordan (Mousa, 2020; WFP.org, 2022; actionagainsthunger.org, 2022).

Figure (1.1): Food security in Jordan overview (GFSI, 2022).



Also, as humans are part of the ecological system that does not sustain without natural resources and due to our responsibility towards the mother earth, society and next generations, researchers are progressively studying methods to achieve business goals while serving society and reducing the negative impact on the environment. Therefore, many concepts related to sustainable business emerged, such as sustainable supply chain, reverse logistics, environmentally- friendly supply chain and green supply chain (Abidi et al., 2017).

Moreover, a significant challenge threatening people's lives and economic stability across the globe is food security; especially during the adversities we are facing nowadays, such as COVID-19, climate change and scarcity of natural resources which represent growing concerns for government agencies and organizations around the world; as they negatively impact food sources such as agriculture, and threaten millions of people's access to food supply (Paslakis, 2021; Rasul, 2021; IPCC, 2019; Watts et al., 2020; Ching & Kajino, 2020).

Food security as a term that refers to the stable access to food and continuous availability of safe food items for all people, is believed to be "tied to everything" since it concerns not only the basic human right to food, and people's health, but also, economic stability and the environment, which explain the nations efforts to achieve and maintain food security (World vision, 2021).

There are several factors that can affect food security, many of them related to supply chains such as, the stability of food supply, availability of food, accessibility to all citizens and more effective food utilization. Improving food supply chain efficiency has a crucial role in attaining food security as it ensures adequate and consistent food supply, and better production, storage, transportation and retailing of food items, which entails more resilience in responding to sudden changes and reduced food insecurity risk (Gov.UK, 2021).

Thus, it is crucial that researchers create paths of survival to the nations with findings which aid policymakers and businesses in implementing strategies, policies and programs that can lead to reaching food security through environmentally sustainable management models.

Therefore, this research aimed to explore the roles and practices of international retailers in implementing sustainable supply chains to attain food security in Jordan.

1.3 Problem Statement

A world where more than enough food is produced but millions of people die out of hunger each year needs major changes to ensure every food item is reserved for its correct use. Demand on food is increasing as world population increases, and the food lost throughout the food supply chain everyday could have been on the dining table of many people.

Also, waste generated from food items and food packaging contributes a significant amount of greenhouse emissions to climate change, and it does not only imply the loss of food but also the waste of the water, energy and time used to produce all the amounts of food, which means more efforts are needed to ensure reducing food loss and food waste through better management of the food supply chain in a sustainable way.

Therefore, to aid international food retailers in overcoming the sustainability and food security challenges, this research pointed these problems as areas that can be improved by international food retailers practices to increase their awareness of their role in implementing sustainable supply chains and their role in attaining food security in Jordan, especially when Jordan is facing additional pressure of meeting not only the increasing demand of citizens but also the refugees despite the lack of resources.

1.4 What makes this research different?

- Although there are many studies about either sustainable supply chain or food security, few researchers studied the relationship between both of them especially in Jordan
- Sustainable supply chain practices are mostly studied in regard to the upper stream of supply chains such as food waste reduction in production stages, however, this research focused on the food retail sector.

- Many researchers focusing on food retail sector analyze their practices from the customers points of view, however, this research investigates sustainable supply chain practices in international food retail stores according to directors, store managers, supervisors, and team leaders' points of view.

1.5 Theoretical and practical significance of the research

This research has both theoretical and practical importance.

From a theoretical side:

- The results of this research should give researchers insights on role of international food retailers in attaining food security in Jordan.
- This research should allow researchers in Jordan to have further information about food retailers' practices in implementing sustainable supply chains.
- It is hoped that this research will support and may add new insights to the existing literature on the food retailers sustainable supply chain practices and their roles in attaining food security.

From a practical side:

- The outcomes of this research should be helpful to the Jordanian government in identifying the role of sustainable supply chain practices in attaining food security in Jordan
- This research supports policy makers and managers of international food retail stores in implementing sustainable supply chains and overcoming food security challenges by presenting a sustainable supply chain model that is specific to the food retail sector and

1.6 Research Purpose and Objectives

The main purpose of this research study is to identify the roles and practices of international retailers in implementing sustainable supply chains through four dimensions (Responsible packaging, reduce, redistribution, recycle) in attaining food security in Jordan. To fulfil this aim, several objectives have been addressed:

- To explore:
 1. How far international food retailers in Jordan implement sustainable supply chain practices
 2. How far international food retailers contribute to attaining food security in Jordan
 3. The role of four sustainable supply chain practices (Responsible packaging, reduce, redistribution, recycle) in attaining food security in Jordan
- To provide:
 1. A sustainable supply chain model that can be implemented in food retail sector
 2. Recommendations that can help international food retailers gain the benefits of implementing sustainable supply chains and support policymakers in achieving food security by implementing sustainable supply chains in the food retail sector.
 3. Bases for further research on the role of sustainable supply chains in attaining food security in Jordan

1.7 Procedural Definitions of terms

1.7.1 Sustainable Supply Chain refers to the long- term coordination among key entities along the supply chain to achieve organizational goals concerning environmental, social, and economic impact through activities that mainly include responsible packaging, reduce, redistribution and recycling

1.7.2 Food Security is the availability of variety of food items options considering customers dietary needs, economic situation, and physical access regardless of national political, economic, or environmental situations while ensuring the best use of each food item during storage and transportation.

1.7.3 Responsible Packaging: Packaging design, choice of materials and processing that are reusable, biodegradable, compostable, recyclable or energy and water efficient, in addition to being efficient in protecting food items during environmental, storage and transportation conditions.

1.7.4 Reduce: minimization of food loss during transportation, storage and display, and reduction of food items wasted due to expiration, over-estimating demand or bad storage conditions, and prevention of food items' packaging waste.

1.7.5 Redistribution: Reallocation of safe and edible food surplus (food items that are close to their “best-before” date, with damaged packaging, incorrectly labelled or fails to meet customer expectations) directly or through food-aid organizations to low-income people with reduced or zero payment.

1.7.6 Recycle: Process food waste to obtain same or lower quality food to be used as animal feed and process food packaging waste to obtain other materials after de-packaging and source separation of all food retail store waste.

1.8 Research Questions

1.8.1 Main research question

This research is devoted to answering the following main question:

What are the roles of implementing sustainable supply chain practices by international retailers in attaining food security in Jordan?

Based on sustainable supply chain elements, the main question is divided into the following:

1.8.2 Sub research questions

In international food retail stores:

- What is the role of implementing responsible packaging practices, in attaining food security in Jordan?
- What is the role of implementing the practices of reducing food loss and food waste, in attaining food security in Jordan?
- What is the role of applying food redistribution, in attaining food security in Jordan?
- What is the role of implementing recycling practices, in attaining food security in Jordan?

1.9 Research Hypotheses

To answer the research questions, the following hypotheses were developed:

1.9.1 Main Hypotheses

H0: Implementing sustainable supply chain practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

Based on sustainable supply chain dimensions, the main hypothesis was divided into the following

1.9.2 Sub Hypotheses:

H0₁: Implementing responsible packaging practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

H0₂: Implementing reducing food loss and food waste practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

H0₃: Implementing food redistribution practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

H0₄: Implementing recycling practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

1.10 Scope of The Research

This research was conducted:

- On directors, managers, supervisors, and team leaders of specific departments of international food retailers in Amman- Jordan; Supply chain, purchasing, compliance and sustainability departments.
- In Amman-Jordan.
- Within the academic year 2021-2022.

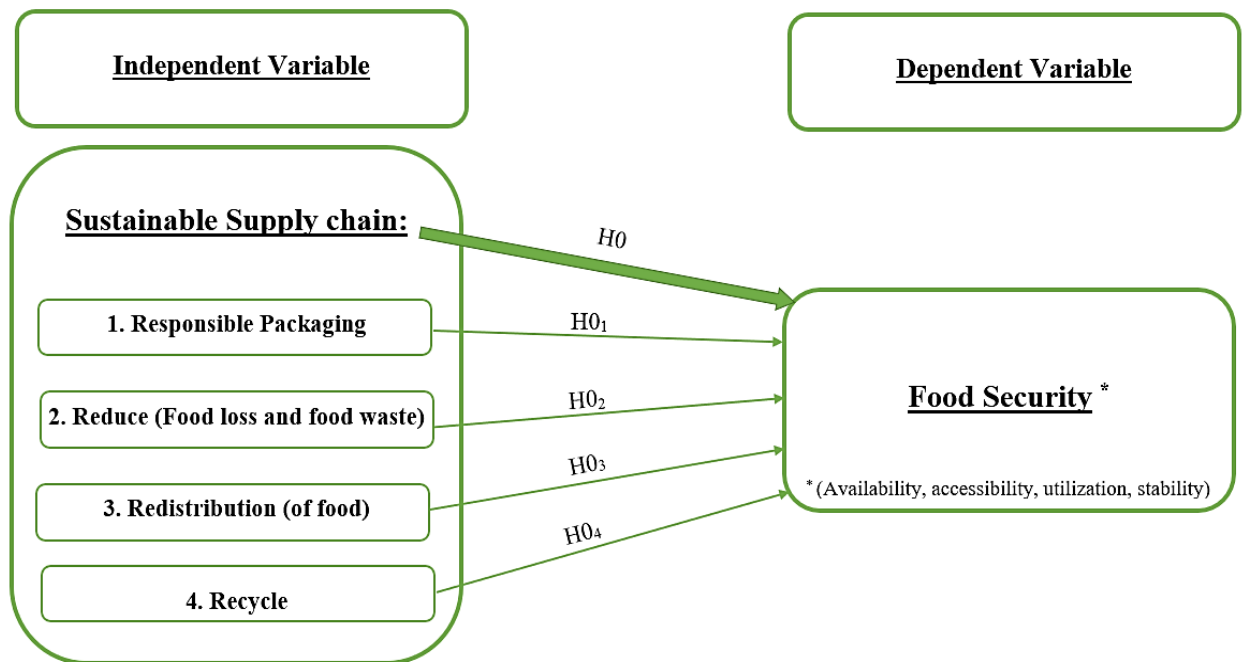
Also, this research investigated international retailers' roles in achieving food security by implementing sustainable supply chain practices especially the dimensions of the presented 4R model (Responsible packaging, reduce, redistribution and recycle).

1.11 Research Delimitations:

- This research was conducted on international food retail sector in Jordan. Therefore, its results cannot be generalized on all food retailers in Jordan or on international food retailers in other geographical areas in the region.
- Only four dimensions of sustainable supply chains and their role in attaining food security were analyzed in this research as the researcher sought, they best fit the food retail sector. As sustainable supply chains have various dimensions, for future research, other dimensions can be studied.
- As this research relied on data collected from questionnaires, other methods, especially interviews could be used to gain more in-depth information.
- The population of this research includes only employees with managerial positions in international food retail stores in Jordan, which led to the relatively small number of respondents (141 respondent; those who filled the questionnaire). Also, the COVID-19 pandemic played a significant role in the reduced number of respondents as the newly implemented regulations in the stores made it difficult to reach many employees and the branches outside Amman-Jordan.

1.12 Conceptual Framework

Figure (1.2) The research study model



This model was developed by the researcher based on the following studies:

- **Independent variable (Sustainable supply chain):**
(Yang et al., 2021; Mousa, 2020; Rivera et al., 2019; Genovese et al., 2017; Sgarbossa & Russo, 2017; Ahi & Searcy, 2015; Verghese et al., 2013; Crum et al., 2011; Gupta & Palsule-Desai, 2011; Ashby et al., 2012; Mentzer et al., 2001)
- **Dependent variable (Food Security):**
(Kuiper & Cui, 2021; Yates et al., 2021; Aji, 2020; Warshawsky, 2020; Sharif & Irani, 2016; Grafton et al., 2015; Pinstруп-Andersen, 2009; FAO & SDD, 2003)

CHAPTER II

REVIEW OF RELATED LITERATURE AND PREVIOUS STUDIES

Introduction

This chapter provides an overview of the main definitions and components of dependent and independent variables of this research

2.1 Literature review

Many researchers investigated sustainability practices, supply chains and food security. The literature provided by them creates a rich base to further the studies on each topic, reach solutions to today's challenges and contribute to shifting global food systems towards being more sustainable to improve global food security and resilience.

2.1.1 Sustainability and supply chain

In the recent decades, with environmental awareness on the rise, business industries recognized the need to focus on social and environmental practices as much as they do on profits, so, many studies such as (Müller & Pflieger, 2014) explored the journey of businesses towards sustainability. Müller & Pflieger (2014) discussed that scarce resources and the pressure from interest groups and different stakeholders led organizations to integrate sustainability with business practices, they also presented ways to merge sustainability within organizational processes such as supply chain, accounting, marketing, and product design, following Porter's value chain model.

According to Nimsai et al. (2020), the reason behind the growing interest of researchers who study supply chain management in sustainability is that SCM links external environment with internal organizational processes since SCM is popularly defined as the management of the flow of goods and services from raw materials to the end consumer which includes the reuse, recycle or disposal phase according to (Fritz, 2019).

A while back, Carter & Rogers (2008) introduced the concept of sustainability to the logistics literature and presented a framework of sustainable supply chain management due to their belief that supply chain managers can impact sustainability through activities such as reducing packaging and requiring more fuel-efficient transportation.

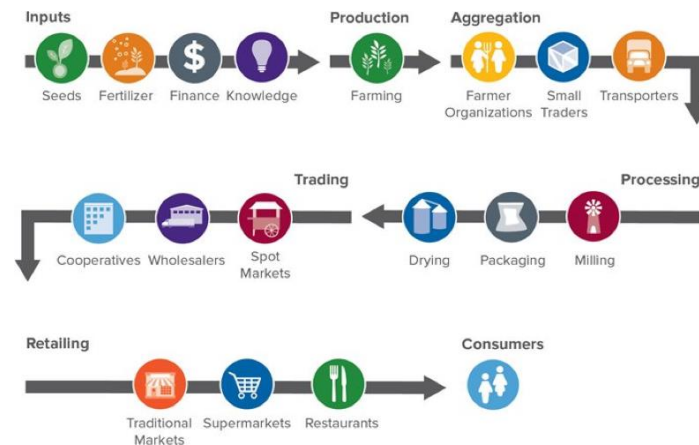
Seuring & Müller (2008, p.1700) defined sustainable supply chain as “The management of material, information, and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental, and social into account which are derived from customer and stakeholders’ requirements”. Although there are many different definitions for SSCM, all definitions link supply chain practices with the triple bottom line approach for (Elkington, 1997) which focuses on three areas: environmental, social, and economic (Morais & Silvestre, 2017).

Also, many authors (Govindan, 2013; Kuo et al., 2010; Luthra et al., 2016; Hong et al., 2019) highlighted the reverse logistics approach which refers to the reuse of materials and goods after being discarded in their typical final destination (Hawks, 2006) by implementing reprocessing operations such as direct reuse, recycling, recovery or re-manufacturing (Schenkel et al., 2015; Bogtjaj & Bogtjaj, 2011) to reduce costs, save resources and achieve many organizational goals (Govindan et al., 2015).

2.1.2 Food supply chains

A supply chain can be defined as a network of entities and activities responsible for passing materials from their sources to the producers, wholesalers, retailers, and consumers (La Londe & Masters, 1994). Also, as figure (2.1) illustrates, food supply chains consist of all the activities that bring inputs from resources to the consumers which include production, aggregation, trading, processing, and retailing.

Figure (2.1): Food supply chains (Reardon et al., 2016)



2.1.3 Sustainable food supply chain

Primarily, food systems are especially interconnected with sustainability concept; since sustainability is concerned with meeting the present demands without compromising future generation's ability to meet their own needs, and food production and supply must always meet demands of the increasing population (FAO, 2011; Derqui et al., 2016).

Accordingly, many related concepts emerged such as food loss which refers to the edible food lost at any stage of the supply chain -especially at the beginning of the food supply chain (production and processing)- that has been discarded, unserved or unmarketable but still safe (Kantor et al., 1997) and food waste, which refers to products discarded from the food chain at the retail or final consumption stage either edible or inedible parts of food as a result of human action/ inaction or decisions by business, government or consumers (Parfitt et al., 2010; Warshawsky, 2020).

Also, many researchers (Mousa, 2020; Rivera, 2018; Akkucuk, 2016; Caldeira et al., 2019; Cicatiello et al., 2020; Yang et al., 2021) integrated sustainable supply chain practices such as responsible packaging, reduce, reuse, recycle and recover with food systems, therefore, they discussed prevention and reduction of food and inventory waste, food loss waste management and recycling, reuse of ingredients for other preparations and food surplus redistribution and donations.

Furthermore, Lundqvist et al. (2008) noted that the significant amount of food waste and food lost between food production process and food consumption, increase greenhouse gas emissions, and cause inefficient use of land and water, which means that there's a need to enhance the management of food processing, packaging, distributing, and retailing, and that is the role of sustainable supply chain management (Ventour, 2008).

As for the focus of this research, four sustainable food supply chain practices will be investigated; Responsible packaging, reduce, redistribution and recycling.

2.1.4 Responsible packaging

Marsh & Bugusu (2007) presented insufficient protection, storage, and transportation of food items as major causes of food waste throughout the food supply chain, this is where the significance of food packaging relies since packaging is important to protect food products and extend their shelf-life, hence their usability. Also, Coles (2003) mentioned food packaging importance in providing consumers with information.

Since food packaging is to solve an issue and create a benefit, it is important to prevent it from becoming an issue itself, in the shape of packaging waste. Therefore, researchers such as (Mracsh & Bugusu, 2007) recommended maintaining balance between food protection and energy cost, increased customers' social and environmental awareness and environmental laws.

The food packaging that is recyclable, reusable, or compostable is referred to as responsible packaging, which is also called environmentally friendly, green, and sustainable packaging (d'Astous & Labrecque, 2021; Wandosell et al., 2021). Responsible packaging is encouraged by consumer demands and the new government regulations in many countries which caused food retailers' growing interest in sustainable, reusable, and recyclable packaging (Packaging digest, 2014).

Although maintaining the quality of food items while cutting packaging material use had been a concern for food packaging suppliers and food retailers, many innovative responsible packaging ideas emerged such as packaging made from corn starch and wood pulp, compostable bottles, wrappers, and cartons made of Poly Lactic

Acid (PLA) and biodegradable materials which can degrade at special conditions. Also, recycled food packaging made from Polyethylene terephthalate (PET) and edible packaging made from natural ingredients (Blumer, 2010). The future of food packaging is known to be towards more responsible and efficient packaging.

2.1.5 Reduce

The second practice which is concerned about food waste prevention is mostly referred to as “reduce.” Many researchers included “reduce” in the R-based frameworks for achieving minimum loss of resources such as the 3R strategy (reduce, reuse, and recycle). Kirchher et al. (2017) analyzed the different R-based frameworks and noted that “reduce” as an act of minimization, reduction, and prevention of resource use, is mentioned in most frameworks as a way to preserve natural resources which when combined with other activities such as “reuse” and “recycle” can make the basic principles of circular economy, which refers to the combination of these activities throughout the supply chain processes to accomplish sustainable development.

As reduction of resources use and waste is a growing concern, researchers such as (Alshemari et al., 2020) studied medicine waste reduction and reduction of resource use in pharmaceutical industry. Also, Nikkhah et al. (2021) investigated the environmental impacts of olive oil refinery and discussed ways to reduce food waste and resource use in olive oil production. Beldek et al. (2016) presented ways to reduce construction waste through sustainable supply chain activities. As well as researchers who presented “reduce” as an effective activity to minimize negative environmental impact and achieve more efficient food supply chains: Halloran et al. (2014) discussed solutions to food waste and food loss and included reduction of resource loss and waste alongside more efficient food packaging and optimization of food utilization, and noted the importance of international public, private and stakeholder collaboration in order to achieve these sustainable solutions. Also, Stenmarck et al. (2011) discussed activities that can aid achieving “reduce” within the food retail sector such as, better order management, food handling and food waste treatment, and highlighted the food retailer’s role in changing employees and customers behaviors and facilitating sustainable actions such as food donations.

2.1.6 Food redistribution

As for the third sustainable supply chain practice investigated in this research, food redistribution refers to the act of redistributing edible food surplus through charitable organizations to donate to people in need or through specialized wholesalers from which low-income people can buy food items in reduced prices (Alexander & Smaje, 2008; Bergstrom et al., 2020).

According to Bergstrom et al. (2020) food redistribution is a familiar concept for food banks and food aid and donation organizations, but its connection to food waste prevention is new. They also presented the significance of food redistribution in reducing greenhouse gas emissions.

Food surplus is often still of decent quality but not sold for several reasons. Therefore, it needs improved logistics management in order to be redistributed within the timeframe that provides maximum utility for recipients to avoid redistributing food that might have passed its expiry date (Van der Horst et al., 2014).

Many researchers such as (Alexander & Smaje, 2008; Vlaholias et al., 2015; Arcuri, 2019) presented food redistribution as an effective way to reduce food waste and confront food poverty; which refers to the inability to access food items due to insufficient income or distance from food centers. In addition to these reasons, food retailers have many motivators to redistribute their food surplus such as corporate social responsibility and improving their image (Holweg et al., 2016).

2.1.7 Recycling

Lastly, recycling is regarded as the most favorable solution if reduction and redistribution are no longer feasible, food waste can be recycled into animal feed, compost, or fertilizers (Papargyropoulou et al., 2014). Moreover, as recycling can create new products from old items' materials, wasted food items packaging made from paper, plastics, or metals, can be processed to end up as ordinary household products (Abella, 2013).

Food retailers may reject food items due to food safety regulations, insufficient quality, damaged packaging, or incorrect labelling. Also, they may dispose food products for reasons such as: poor inventory management, inaccurate forecasting, damage during display or insufficient remaining shelf-life (best before and use by dates) (Downes et al., 2017). Therefore, significant amounts of food waste that is not suitable for human consumption can be generated and retailers must take some action to divert it from landfills through recycling initiatives.

Mena et al. (2014) presented lack of sufficient information on recycling options, lack of commitment and lack of KPIs related to waste management as key obstacles for retailers willing to recycle. Also, other factors such as high costs of recycling infrastructure and willingness for collaboration from different stakeholders, are mentioned in the literature (Downes et al., 2017).

Although many researchers studied the different practices of sustainable supply chains in the food industry, there is a lack of research on the relationship between these activities and food security, especially from a food retail perspective.

2.1.8 Food security

According to Von Braun (1992), food security as a concept appeared in the late 1960s, then it evolved over the years until it reached the current widely accepted definition which came from (FAO, 2003) and refers to food security as “a situation that exists when all people at all times have social, physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences to lead an active and healthy life”.

Derived from the definition, there are four dimensions of food security: availability, accessibility, utilization, and stability (FAO, 2009).

Food availability is known to be measured even before the concept of “Food Security” appeared and it is the term used to refer to the total calories available to a population in the form of edibles produced or imported into a country (FAO, 2001), which is recognized by food retail sector as the amount of food items physically available. Although, this definition outlines food availability as a primary factor for

determining a country's food security, researchers recognized that there should be another factor in order to ensure access to the available food (Jones et al., 2013).

Therefore, Sen (1981) shed lights on the importance of food access in determining food security, by presenting examples from history on famine in countries with sufficient national food supply. He also discussed that food might be inaccessible when food prices are high even if food is available. To consider food accessible, food items should be physically and financially accessible to be acquired by households, safe to consume and culturally acceptable (Pinstrup-Anderson, 2009).

Also, household food allocation for individuals became a concern, therefore the term "Utilization" appeared to reflect the allocation differences of food and nutritional variations within households (FAO, 1996). Bringing food retail sector more into focus rather than households, food utilization can be a good indicator for the amounts of food reprocessed for food and non-food uses and the amounts of food lost during storage and transportation (FAO, 2012; Pinstrup-Anderson, 2009).

The fourth pillar is highlighted in the term "at all times" in the food security definition, which refers to the stability of food security over time despite weather events, regional conflicts, and any other shocks (Barret, 2010). In the food retail sector, stability can reflect the continuousness of basic food items availability and the readiness for dealing with factors that could cause food insecurity (Pinstrup-Anderson, 2009).

These four dimensions are known to be necessary for ensuring food security and many studies linked them with production, distribution, processing, consumption, and sustainability, and discussed the importance of reducing food loss and food waste throughout the supply chain processes (Timmer, 2012; Alder et al., 2012)

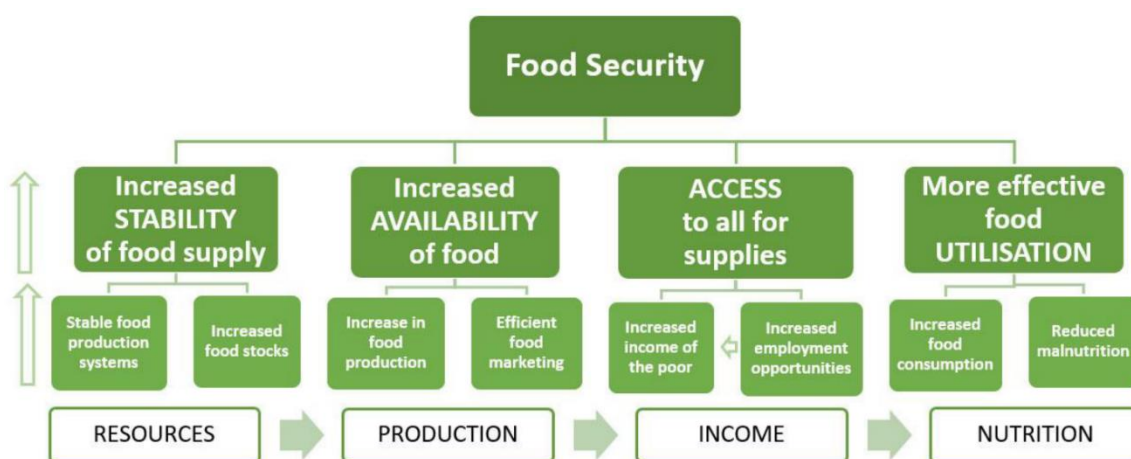
Also, many researchers (Konefal et al., 2005; Morgan et al., 2008; Humphrey, 2006; Fuchs & Kalfagianni, 2010) discussed the importance of food retail sector in food security due to the growth in retail size and reach, and the emergence of large international supermarket chains which led to an increase in their economic power that can facilitate their ability to dictate prices for their suppliers and structure the behaviors of different actors in the supply chain especially, with the increased delegation of power to private sectors from governments.

The efforts to further investigate the integration between food security and food supply chain with sustainability are growing constantly. Pinstrup-Anderson & Herforth (2008) and Richardson (2010) discussed the importance of sustaining natural resources for achieving food security and explained environmental sustainability impact on food availability and the other food security dimensions.

2.1.9 Aspects contributing to Food Security

There are many aspects that contribute to the four pillars of food security, as portrayed in the figure 2.2 (FAO.org, 2020); land and natural resources impact the stability of food production systems and food stocks, food production impacts the availability of food, employment rates and income impact accessibility to food items and food consumption of more nutritious food causes more effective food utilization. All of these aspects lead in a way to food supply chains, which is concerned with all the process that the food items go through from being raw materials to prepared food on the consumer's table.

Figure (2.2) Aspects contributing to food security (FAO.org, 2020); adapted from Saad, 1999; Metz, 2002; Webb et al., 2002).



2.1.10 The role of sustainable supply chains in food security

The food supply chain mainly consists of producing, processing, and packaging food and then there are the activities of food distribution, retailing and consumption. Various studies discussed that integrating sustainability with these activities support achieving food security and concluded that the impact of environmentally sustainable practices on food security cannot be denied (Sustainable development commission, 2009) due to many reasons such as, the importance of the portion of food lost throughout the food supply chain activities, the negative consequences of food waste on agricultural lands and its long-term impact on climate (Messner et al., 2020; Göbel et al., 2015; Yates et al., 2021).

Moreover, researchers such as (Vågsholm et al., 2020) highlighted the link between sustainable food production, circular food systems, making better use of produced food and food security as key elements to achieve a sustainable future. Also, they presented limiting food loss and waste, and recycling food items, as effective ways for achieving sustainability and food security.

Also, Lipinski et al. (2013), discussed the interconnection between food loss and waste with the loss of resources used during production and distribution of food such as, capital, labor, water, and energy, and suggested that sustainability, food waste and food security are deeply intertwined. Cheng et al. (2018) presented the sale and use of organic products, installation of energy-saving facilities in food retail and restaurant sector and the provision of variety of healthy food items, as parts of sustainable food supply chains and contributors to food availability, accessibility, and utilization. Furthermore, Schubert et al. (2010) viewed the use of biodegradable or recycled products and food retail support for locally grown food as drivers for food availability and utilization.

“Innovations that are guided by smallholder farmers, adapted to local circumstances, and sustainable for the economy and environment will be necessary to ensure food security in the future”

Gates, B (Gatesfoundation.org, 2009)

The overview of related literature provided in this research, concludes that researchers' interest in sustainability increased by the influence of the Triple Bottom Line concept emergence. Therefore, they started investigating the links between sustainability and different business practices which led to the development of sustainable supply chain concept, where many supply chain practices are viewed from an environmentally friendly perspective.

Most research studies that focused on sustainable supply chain practices, investigated those practices either in production stage, distribution stage or consumption stage. Therefore, the various models presented to describe sustainable supply chain practices were most fitted to the contexts of their studies which led the researcher of this study to present a model that would fit the food retail sector so that it can be used to investigate the role of these specific four dimensions of sustainable supply chains in attaining food security from a managerial perspective despite the fact that food security is mostly explored through studying consumers rather than food retailers.

Understanding the roles of sustainable supply chain practices in food security should lead to better decision making in food retail sector and more collaboration between governmental institutions and food retailers, which can result in better allocation of resources and a step further towards higher food security.

CHAPTER III

METHODOLOGY

Introduction

This chapter includes research methodology, design, statistical techniques in data analysis, population and sample, research instrument, procedure of data collection, validity, and reliability.

3.1 Research Design

This research followed a quantitative-descriptive approach. Primary data was collected from employees with managerial positions in international food retail stores in Jordan, through self-completion questionnaires, in a non-contrived setting and no interference with the normal work routine. The International food retail stores have been selected, believing that those stores have a documented operations procedures and work based on international standards.

3.2 Statistical techniques in data analysis

Data collected from the sample was analyzed using SPSS. The tests included frequency distribution for demographic analysis, descriptive statistics such as Mean and Standard deviation to provide basic information about variables and potential relationships between them, reliability analysis through Cronbach Alpha value, correlation analysis through correlation matrix, multicollinearity test and multiple regression analysis to test the hypotheses.

3.3 Population and Sample

3.3.1 Population

International food retail stores are the field of this research, the population the population consisted of four hundred and eight (408) employees with managerial positions in four international food retail brands in Amman-Jordan (53 stores), (141) employee responded to the conducted questionnaire, as illustrated in table (3.1) below.

Table (3.1) Study population

International food retail brands chosen	4
Total branches	53
Total number of employees with managerial positions	408
Employees with managerial position who have direct supply chain experience	200
Respondents	141

3.3.2 Sample and sampling techniques

A purposive sampling technique was used to select certain employees with managerial positions from four international food retail stores in Jordan (Carrefour, Cozmo, Safeway, and C-Town), who have direct engagement in the sustainable supply chain practices included in the research model.

3.4 Research instrument

To achieve the research’s objectives, data was collected through questionnaires. All demographic variables such as Gender, age, managerial position, and size of retail store were tapped by direct single questions. The questionnaires items were anchored on a 5-point Likert scale where:

Table (3.2) Research instrument Likert Scale

Strongly disagree (1)	disagree (2)	Moderate (3)	Agree (4)	Strongly agree (5)
-----------------------	--------------	--------------	-----------	--------------------

The questionnaire was designed of five (5) parts with four (4) demographic questions and twenty-four (24) questions on variables as follows in the table (3.3):

Table (3.3) Questionnaire design

Section	Number of questions
Demographic questions	4
Independent variable 1: Responsible packaging	4
Independent variable 2: Reduce	5
Independent variable 3: Redistribution	3
Independent variable 4: Recycle	6
Dependent variable: Food security	6
Total	28

3.5 Procedure of data collection

Data from employees with managerial positions in international food retail store in Amman-Jordan was gathered through personally administered self-completion questionnaires as a source of primary data.

The researcher obtained lists of employees who have direct experience in supply chain management from human resources departments of the selected food retail brands and booked meetings with the employees to distribute the questionnaire and provide answers to the employees inquires (if any).

Although the procedure of data collection took a long time due to COVID-19 and its implications on companies' guidelines, the researcher ensured that the questions were clear to respondents and the process of filling the questionnaire had no issues.

3.6 Validity and Reliability

3.6.1 Validity

In order to assess *content validity* of the questionnaire, it was distributed to a number of research experts, six (6) professional researchers provided their reviews about clarity of the questions and their fit to measure the dimensions. To insure the *construct validity*, the questions were designed based on various measurements used in the literature after thoroughly analyzing related previous studies. Regarding *face validity*, as the questionnaire was personally administered, the researcher found that the respondents had no difficulties in answering the questions (Completion rate = 99%, typical time spent = four (4) minutes and 56 sec; based on information provided by SurveyMonkey), which is also indicated by the number of skipped questions presented in the table (3.4) below:

Table (3.4) Insights on questionnaire

Section	Number of questions	Number of participants who skipped the section
Demographic questions	4	1
Independent variable 1: Responsible packaging	4	1
Independent variable 2: Reduce	5	1
Independent variable 3: Redistribution	3	2
Independent variable 4: Recycle	6	2
Dependent variable: Food security	6	2
Total	28	Total participants who skipped a section or more ≤ 2

Also, according to Hargreaves & Mani (2015), Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy that is above 0.5 implies adequate sample, for this research, KMO has rated 82% which indicates good adequacy, while Chi-square is 680.86 which implies the fitness of the model and the significance of Bartlett's Sphericity is less than 0.05, which indicates the factor analysis was useful.

Table (3.5) Validity test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.821
Bartlett's Test of Sphericity	Approx. Chi-Square	680.859
	df	10
	Sig.	.000

3.6.2 Reliability

According to Sekaran & Bougie (2016), reliability of a measure is measured by testing for consistency and stability; that is to evaluate how well the research instrument measures what the researcher actually wants to measure.

3.6.2.1 Cronbach Alpha value test

The researcher used the value of Cronbach alpha to evaluate reliability of the research instrument, the acceptable value of Cronbach alpha is at least 0.7 or more (Sekaran & Bougie, 2016). The following analysis of reliability in the table (3.5) shows that Cronbach alpha value of all the Likert scaled questions are greater than 0.70 indicating that the consistency of the values is in the acceptable form to conduct the further analysis regarding the hypotheses testing.

Table (3.5) Cronbach Alpha test

<i>Variables</i>	<i>Cronbach alpha</i>	<i>Number of questions</i>
<i>Responsible packaging</i>	<i>0.996</i>	<i>04</i>
<i>Reduce</i>	<i>0.987</i>	<i>05</i>
<i>Food redistribution</i>	<i>0.975</i>	<i>03</i>
<i>Recycle</i>	<i>0.995</i>	<i>06</i>
<i>Food security</i>	<i>0.973</i>	<i>06</i>

3.7 Quantitative data analysis: Hypotheses testing

To test the hypotheses, multiple regression analysis was used with parameters such as Beta, r and r squared.

According to (Sekaran & Bougie, 2016), Beta as a regression coefficient represents the change in dependent variable for one-unit change in the independent variable; where in this research, the hypotheses were tested according to the amount of change in food security for 1 unit of each sustainable supply chain dimension (Responsible packaging, reduce, redistribution and recycle), and the t statistics test the linearity importance of the beta coefficient obtained.

Also, while conducting linear regression analysis, r and r² are important measure where the correlation coefficient (r) is known as a measure of strength and direction of the linear relationship between variables and the coefficient of determination R² represents the “percentage of variance in the dependent variable that is explained by the variation in the independent variable”.

CHAPTER IV

RESEARCH RESULTS, DISSCUSSION AND INTERPRETAION

Introduction

As this research aims to identify the roles and practices of international retailers in implementing sustainable supply chains and some of its dimensions (Responsible packaging, reduce, redistribution, recycle) in attaining food security, the collected data were analyzed to provide basic information about the variables of the presented model, reliability of the distributed questionnaire, correlation, and multicollinearity between variables, as well as the analysis of hypotheses test.

Accordingly, this chapter presents the results of the conducted analysis

4.1 Overview of respondents' profile

As shown in the table (4.1) below, among the total number of respondents, 70% were male which implies that female employees who hold managerial positions related to supply chains are less than males. Most of respondents belonged to the age group of (30 – less than 40) and the least number of respondents belonged to the age group of (50 or above) which represent the overall characteristic of Jordanian society, which has one of the youngest populations in the world and implies that employees in Jordan food retail sector are mostly under the age of forty (40).

Also, among all respondents, around 48% were managers while the least percentage of respondents were directors due to the fact that there are fewer directors in each food retail brand in comparison with other employees, and that it was difficult to contact some of the directors due to their busy schedules. This also justifies that the majority of respondents were younger than 40 years old as they were mainly lower and middle level managers rather than top management such as directors.

In terms of the size of retail store, Large and medium shaped were nearly equally observed since each of the international food retail companies targeted by the questionnaire has more large branches such as hypermarkets and fewer small branches such as “Express” and “Simply.”

Table (4.1) Overview of respondent's characteristics

Gender		Age		Job Position		Size of retail store	
Female	30%	20- less than 30	34%	Director	10%	Small	27%
Male	70%	30- less than 40	36.9%	Manager	47.9%	Medium	36.2%
		40- less than 50	22%	Supervisor	22%	Large	36.9%
		50 or above	7.1%	Team leader	19%		

Table (4.2) Respondents' characteristics and demographic variables

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	42	29.8	29.8	29.8
	Male	99	70.2	70.2	100.0
	Total	141	100.0	100.0	
Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 – less than 30	48	34.0	34.0	34.0
	30 – less than 40	52	36.9	36.9	70.9
	40 – less than 50	31	22.0	22.0	92.9
	50 or above	10	7.1	7.1	100.0
	Total	141	100.0	100.0	
Job position					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Director	15	10.6	10.7	77.9
	Manager	67	47.5	47.9	67.1
	Supervisor	31	22.0	22.1	100.0
	Team leader	27	19.1	19.3	19.3
	Total	140	99.3	100.0	
Missing	System	1	.7		
Total		141	100.0		

Size of retail store					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Small	38	27.0	27.0	27.0
	Medium	51	36.2	36.2	63.1
	Large	52	36.9	36.9	100.0
	Total	141	100.0	100.0	

4.2 Descriptive analysis

The descriptive analysis includes mean and standard deviation. Mean value analysis, which is a measure of central tendency, indicates that there is a moderate to high level of implementation of Responsible packaging, reduce and recycle and an above moderate food security level in international food retail stores in Jordan, while the level of implementing Responsible packaging is relatively low since “Reduce” generates the highest mean value 3.67 and “Food redistribution” obtained lowest average value, which is 2.76, as presented in (Table 4.3).

Also, standard deviation ranged between 0.87 for food redistribution practices and 1.25 for reducing food loss and food waste practices, which implies that although food redistribution practices are implemented less than other practices, their implementation is more consistent than the other practices even when they are implemented more.

Table (4.3) Descriptive analysis

	N	Range	Mean	Std. Deviation	Variance
Responsible packaging	140	4.00	3.1915	1.12624	1.268
Reduce	140	5.00	3.6652	1.25277	1.569
Food redistribution	139	4.67	2.7562	.86901	.755
Recycle	139	4.50	3.0023	1.12412	1.264
Food security	139	5.00	3.6086	1.09518	1.199

4.3 Correlation Analysis

To assess the size and direction of the linear relationship between sustainable supply chain and Food security, a bivariate Pearson’s product-moment correlation coefficient (r) was calculated. The bivariate correlation between these variables were positive and strong. Table (4.4) summarizes the correlations results of the main research variables. All the correlations are significant at $p < 0.01$ and $p < 0.05$ and all the independent variables are positively and significantly correlated with Food security. From supply chain dimensions, the “Reduce” practice is highly correlated with the Food security at ($r = 0.903$). On the other hand, the lowest correlation exists between Food redistribution practices and Food security ($r = 0.648$).

Table (4.4) Correlation matrix

Correlations						
		Responsible packaging	Reduce	Food redistribution	Recycle	Food security
responsible packaging	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	140				
Reduce	Pearson Correlation	.696**	1			
	Sig. (2-tailed)	.000				
	N	140	140			
food redistribution	Pearson Correlation	.674**	.477**	1		
	Sig. (2-tailed)	.000	.000			
	N	139	139	139		
Recycle	Pearson Correlation	.743**	.735**	.673**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	139	139	139	139	
Food security	Pearson Correlation	.811**	.903**	.648**	.855**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	139	139	139	139	139

**Correlation is significant at the 0.01 level (2-tailed).

4.4 Multicollinearity test

According to Hair et al. (2019), the predicted path coefficients can be influenced if the independent variables are related among themselves. The variance inflation factor (VIF) and tolerance level can be used to detect multicollinearity. The recommended variance inflation factor (VIF) level is less than 5 and tolerance is greater than 0.10. (Hair et al., 2019). In this research, the highest VIF is 3.297, which is acceptable. The tolerance value is also within an acceptable range (between 0.10 and 1.00). As a result, multiple regression analysis is appropriate for analyzing data and testing hypotheses of this research. (Table 4.5)

Table (4.5) Multicollinearity test

Coefficients ^a			
Model		Collinearity Statistics	
		Tolerance	VIF
1	Responsible packaging	.340	2.939
	Reduce	.397	2.521
	Food distribution	.465	2.150
	Recycle	.303	3.297
a. Dependent Variable: Food security			

4.5 Results Pertaining Hypotheses

Multiple regression analysis was used to test the research hypotheses:

H0: Implementing sustainable supply chain practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

As shown in table (4.6) below, the results of multiple regression analysis of the four (4) dimensions of sustainable supply chain against food security, showed that R square = 0.917, which indicates that the four variables of this research model of sustainable supply chain have roles in explaining the variation in the dependent variable (Food Security) as the adjusted R Square = 0.915, when multiplied by 100%, the value of adjusted R Square will be 91.5%. This percentage indicates that 91.5% of the variation in Food Security levels is due to the implementation of Sustainable Supply Chain practices investigated in this research study.

Therefore, the main null hypothesis (H0) of this research is rejected and the alternative hypothesis which states that Implementing sustainable supply chain practices by international food retailers has a role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$) is accepted.

Table (4.6) Multiple Regression Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.958 ^a	.917	.915	.31994
a. Predictors: (Constant), Recycle, food redistribution, Reduce, responsible packaging				

As the purpose of ANOVA in this research (shown in Table (4.6) below) is to detect whether there is a significant relationship between food security and Responsible packaging, reduce, redistribution and recycle, the p-value (sig) = 0.000 which is less than 0.05 and highly significant, the F test rejects the null hypotheses that state that there are no roles of implementing the 4Rs model in attaining food security in Jordan. Since $F = 376$, it is concluded that it is not possible that the variation occurred by chance.

Table (4.6) ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	153.997	4	38.499	376.119	.000 ^b
	Residual	13.921	136	.102		
	Total	167.918	140			
a. Dependent Variable: Food security						
b. Predictors: (Constant), Recycle, food redistribution, Reduce, responsible packaging						

In table (4.7), the constant = 0.23 which is the estimate of Beta_0 which has a (Sig) = 0.000, which is highly significant. This estimate indicates that the average value of Food Security would be 0.23 if no sustainable supply chain practices were implemented.

Table (4.7) Multiple Regression Coefficients

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.230	.100		2.288	.024
	Responsible packaging	.168	.041	.172	4.071	.000
	Reduce	.476	.034	.544	13.879	.000
	Food Redistribution	.121	.046	.096	2.660	.009
	Recycle	.255	.044	.262	5.843	.000
a. Dependent Variable: Food security						

The unstandardized coefficient of “Responsible Packaging” practices is 0.168, which is significant at 1% level of significance and indicates that if international food retailers increase implementing Responsible packaging practices in their stores by 1 unit, food security will increase by 0.168 units, keeping other variables consistent.

Therefore, the null hypothesis (H_{01}) that states that Implementing responsible packaging practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$) is rejected. It can be concluded that implementing responsible packaging practices by international food retailers has a significant role in attaining food security in Jordan

Also, the unstandardized coefficient of “Reduce” practices is 0.476, which is also significant at 1% level of significance and indicates that if international food retailers increase implementing reducing food loss and food waste by one unit, food security will increase by 0.476 units, keeping other variables consistent.

Therefore, the null hypothesis (H_{02}) that states that Implementing reducing food loss and food waste practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$) is rejected.

Moreover, the unstandardized coefficient of “Food redistribution” is 0.121, which is significant at 1% level of significance and indicates that if international food retailers increase implementing food redistribution practices by one unit, food security will increase by 0.121 units, keeping other variables consistent.

Therefore, the null hypothesis (H_{03}) which indicates that Implementing food redistribution practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$) is rejected. And it can be concluded that implementing food redistribution practices by international food retailers has a role in attending food security in Jordan.

As for Recycling practices, Beta = 0.255, $p < 0.01$. which indicates that if international food retailers increase implementing recycling practices by one unit, food security will increase by 0.255 units, keeping other variables consistent.

Thus, the null hypothesis ($H0_4$) which indicates that Implementing recycling practices by international food retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$), is rejected, since implementing recycling practices in international food retailers has a significant role in attaining food security in Jordan.

4.6 Summary of results

Results of the conducted analysis can be concluded as follows:

- All the null hypotheses of this research were rejected as it has been statistically proven that all the investigated dimensions of sustainable supply chains (Responsible packaging, reduce, redistribution, recycle) had significant roles in attaining food security
- Although all the sustainable supply chain practices of the 4Rs model in this research had positive roles in attaining food security. “Reduce” had the most significant role while “food redistribution” had the least significant role.
- The level of implementing “Reducing” practices in international retail stores in Jordan was the highest amongst the other sustainable supply chain practices, while “Food redistribution” practices were the least implemented practices.
- Implementing “Reduce” practices process was not consistent which may lead to difficulties in measurement and inconsistency of the level of implementation on the long-term bases

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

This research was dedicated to answer the main question what are the roles and practices of international retailers in implementing sustainable supply chains to attain food security in Jordan? Through investigating the role of each sustainable supply chain dimension in attaining food security, therefore, data was collected by a questionnaire and correlation and multiple regression were used to test the hypotheses.

5.1 Discussion of results

This research concluded that implementing sustainable supply chain practices especially responsible packaging, reduce, redistribution and recycle, by international food retailers, have significant roles in attaining food security in Jordan which came in accordance with the (Kuiper & Cui, 2021) study, which concluded that food loss reduction efforts in processing and production stages have strong impact on food security and environment.

Also, the results shed lights on the role of food redistribution practices in food retail sector in Jordan, in attaining food security by reducing food loss and food waste, which was in line with (Bergstrom et al., 2020) study, which presented food redistribution as a solution for the amounts of food surplus in retail sector in Sweden.

Moreover, linking sustainable supply chain practices and food security in this research was in harmony with many research studies such as (Krishnan et al., 2020; Chan et al., 2020) where researchers called for redesigning food supply chains and food security initiatives to become more environmentally sustainable.

Furthermore, researchers who investigated food security in Jordan such as (Khader et al., 2019) encouraged research on different sources of food loss and waste throughout supply chains to provide solutions that can contribute to reducing the amounts of food wasted, therefore, the researcher of this study believes that the insights

provided by this research on sustainable supply chain practices in food retail sector in Jordan and the presented 4Rs model should be useful for decision makers.

5.2 Summary and conclusions

As a result, to the conducted analysis:

- This research provided new insights on the roles and practices of international food retailers in attaining food security in Jordan as it provides statistical evidence that implementing the 4Rs model presented in this research has a significant role in attaining food security in Jordan
- This research creates a base to further research on the retail side of supply chains whilst the majority of sustainable supply chain researchers focus on manufacturing and most food security research focus on consumers
- The results showed that applying responsible packaging, reduce, redistribution and recycle as a part of sustainable supply chain practices by international food retailers, increases food security in Jordan
- This research highlights “Reducing” as the most implemented sustainable supply chain practice in international food retailers in Jordan, which is also the variable that has the most significant role in attaining food security in Jordan

5.3 Recommendations

- This research recommends implementing Sustainable supply chain practices to international food retailer in Jordan, as the literature shows the numerous benefits of these practices for the society, environment, and the business itself, also, as the results of the research analysis concluded that implementing these practices has a positive role in attaining food security in Jordan
- Although implementing one of the dimensions of sustainable supply chain (Reduce) has the most significant role in attaining food security in Jordan, it is recommended that international food retailers implement the dimensions of the 4Rs model presented in this research as they all proved to have significant roles in attaining food security in Jordan

- Governmental institutions in Jordan are advised to encourage Sustainable supply chain practices in the food retail sector as it has a positive influence on a national goal which is attaining food security
- International food retailers in Jordan, are advised to improve their links with food banks and non-governmental entities to implement more food redistribution practices

5.4 Suggestions for future research

- This research studied only four dimensions of Sustainable supply chains, whereas there are many other dimensions such as recover, reuse, reform, repair, remanufacturing, low carbon logistics, life cycle analysis and energy efficiency, which can be investigated, and their relationship with food security can be studied.
- This research focuses on the sustainable supply chain practices in the international retail sector in Jordan. Local food retailers' practices can be investigated in future research, also, sectors other than the retail sector in Jordan can be studied.
- The same areas of this research can be investigated but in other geographical areas than Jordan such as countries in the Mediterranean region
- Future research is encouraged to use other methods of data collection such as, interviews, to have more in-depth insights on the research topic, since many conditions could affect the implementation of sustainable supply chain which is a matter that involves various parties such as government institutions, health institutions and policy makers in food retail stores.

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Appendices

Appendix A: Questionnaire

Dear Participant,

As part of the requirements for the completion of my Masters of International Management at LUISS and MBA degree at the University of Petra, I am conducting a questionnaire that is designed to study the roles of sustainable supply chain practices (Responsible packaging, Reduce, Redistribution, Recycle) in international food retail sector, in attaining Food Security in Jordan.

Because you are the one who can provide a correct picture about the research topic, I request you to respond to the questions frankly and honestly.

Your response will be kept strictly confidential, and a summary of the results will be mailed to you after the data are analyzed.

your participation in this questionnaire is completely voluntary, you may dismiss altogether, or leave blank any questions you do not wish to answer.

Thank you very much for your time and cooperation.

Sincerely yours,

Maryam Alfasisi

Participant's details

Gender: Female Male

Age: 20 – less than 30 30 – less than 40 40 – less than 50 50 or above

Job position: Team leader Manager Director Supervisor

Size of retail store: Small Medium Large

Strongly disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly agree (5)
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Sustainable supply chain – Responsible packaging : Packaging design, choice of materials, and processing that are reusable, biodegradable, compostable, recyclable, or energy and water-efficient.

Appendix A Table 1. Responsible packaging

	(1)	(2)	(3)	(4)	(5)
We require our suppliers to use food packaging that is recyclable, reusable, or compostable (through packaging performance tests, i.e., compression testing)					
When we order food items, we consider the efficiency of food packaging in protecting food items during environmental, storage and transportation conditions					
We provide recyclable, reusable, or compostable packaging for In-store packaging (Fresh food, bakery, and poultry packaging)					
We provide our employees with sufficient knowledge about responsible packaging choices and its importance					

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Sustainable supply chain - “Reduce” :Using fewer natural resources and materials, minimization, reduction, and prevention of resource use and waste.

Appendix A Table 2. Reduce

	(1)	(2)	(3)	(4)	(5)
Our employees have knowledge regarding how to organize and store food items and know the best practices for handling food waste					
In our stores, food items with short shelf-life are on display to reduce food waste					
We make price reductions and promotions on food items near-expired dates					
The company implements forecasting demand techniques to reduce food waste					
We keep food items in the right temperatures and light to maintain their quality and usability and reduce food waste					

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Sustainable supply chain - Food redistribution: Reallocation of safe and edible food surplus (food items that are close to their “best-before” date, with damaged packaging, incorrectly labeled, or fails to meet customer expectations) directly or through food-aid organizations to low-income people with reduced or zero payment.

Appendix A Table 3. Food redistribution

	(1)	(2)	(3)	(4)	(5)
Our employees have sufficient knowledge on food redistribution opportunities					
We have established connections with charitable organizations or Food banks to redistribute food surplus to people in need					
We collaborate with specialized wholesale markets to redistribute our food surplus to low-income people with discounted prices					

Sustainable supply chain- “Recycle”: Process materials to obtain the same or lower quality

Appendix A Table 4. Recycle

	(1)	(2)	(3)	(4)	(5)
We have sufficient information about categories of food waste and how it is managed					
We have established logistics with recycling facilities to distribute our food loss and waste					
Local farmers can have access to our food loss/waste to use as animal feed					
The process of de-packaging is well managed onsite/offsite					
There are source-separation equipment in our stores (ex: Recycling bins)					
We consider investing in upgrading our recycling infrastructure					

Food Security (Availability, Accessibility, Utilization and Stability): the availability of quality and diverse food to always provide all people with the required quantity through adequate production, distribution, and exchange to ensure meeting demand with securing people’s access to basic food during the rapid changes of population, environment, and production.

Food security is built on four pillars: availability, accessibility, utilization, and stability

Appendix A Table 5. Food Security

	(1)	(2)	(3)	(4)	(5)
We offer a variety of food items options considering customers dietary needs and economic situation					
Basic food items are available at our stores at all times (regardless of national economic, political, and environmental situation)					
When locating our stores, we consider easy physical access by the largest number of customers					
Frequently, there are promotions and price reductions in our stores to help more customers access food items					
There is an established system to control food lost during transportation and storage (to ensure the best use of every food item)					
There are plans for dealing with risks regarding food availability to ensure sufficient supply at all times					

Thank you

1 **Exploring the roles and practices of international retailers in implementing**
2 **sustainable supply chains to attain food security in Jordan**

3 **ABSTRACT**

4 This research study focused on investigating the practices of international food
5 retailers in Jordan in implementing four specific dimensions of sustainable supply
6 chains (Responsible packaging, reduce, redistribution and recycle) and the role of this
7 implementation in attaining food security in Jordan. To fulfil the objective of this
8 research, the researcher designed and distributed a questionnaire to two hundred (200)
9 employees selected based on purposive sampling method, out of the population which
10 consisted of four hundred and eight (408) employees with managerial positions in four
11 international food retail brands in Amman-Jordan (53 stores). One hundred and forty-
12 one (141) employees responded to the conducted questionnaire.

13 The collected data was analysed by a set of statistical models such as, frequency
14 distribution for demographic analysis, descriptive statistics to provide basic information
15 about variables and potential relationships between them, reliability analysis through
16 Cronbach Alpha value, correlation analysis through correlation matrix,
17 multicollinearity test and multiple regression analysis to test the hypotheses, by using
18 Statistical Package for social sciences (SPSS).

19 The results revealed that implementing the four sustainable supply chain practices
20 of this research's model (Responsible packaging, reduce, redistribution and recycle) by
21 international food retailers has a positive role in attaining food security in Jordan, which
22 means that if international food retailers in Jordan implement these practices more, they
23 will play a bigger role in attaining food security in Jordan.

24 Therefore, the researcher recommends that the international food retailers need to
25 put more efforts to implement the model presented and that the government is called
26 out to encourage applying sustainable supply chain practices in the food retail sector,
27 as food security is a major national concern. Also, for future research, it is
28 recommended that more dimensions of sustainable supply chain be investigated, and
29 other data collection methods be used to give more insights on the research topic.

30 **Keywords:** Sustainable supply chain, food security, international food retail, Jordan

31 **Background**

32 Around 1.3 billion tons of food are wasted globally each year, which represent
33 approximately one-third of global food production (Amecarelli & Bux, 2021; FAO,
34 2019; IFRI report, 2019). Also, many studies indicated that retailers have a major
35 influence on the operations of raw material's providers and suppliers as well as on
36 consumer behaviors, which means they can re-shape the upstream and downstream
37 supply chain processes (Cicatiello et al., 2020). Furthermore, studies such as (Pereira
38 et al., 2014; Fuchs et al., 2012; Policy brief, 2017) discussed the importance of retail
39 sector in achieving food security especially in times of conflict, pandemic-related
40 economic shocks, and climate change; while the food supply and agricultural outputs
41 are negatively affected, demand on food items is higher and food prices are rising
42 (FAO, 2011; Torero, 2020).

43 Therefore, reducing post-harvest food loss has become a global concern and
44 researchers aim to further investigate ways to reduce waste production and turn
45 produced food waste to valuable inputs in the supply chain through adopting more
46 responsible packaging, food surplus redistribution, maximizing resource reuse,
47 recovery, and recycling (Sgarbossa & Russo, 2017; Rivera et al., 2018; Diaz-Ruiz,
48 2019).

49 **Context of the research**

50 The World Bank (2017) classified Jordan as a lower-middle income country, with a
51 population of around 10.5 million (DOS-Jo, 2020). Since it has limited supply of natural
52 resources and agricultural land, and many economic challenges to face such as high
53 poverty rates and unemployment. Jordan has many programs to help overcoming these
54 challenges, such as, the Jordan Economic Growth Plan 2018-2022 (JEGP, 2018).

55 Jordan is also classified as a food secure country with a score of 8.8 on the
56 (Global hunger index, 2020) which is a 100-point Scale, where zero is the best score
57 (no hunger) and 100 is the worst. Jordan, however, scores 55.2 on an indicator from 0-
58 100 in food availability (GFSI, 2020).

59 Accordingly, and due to the fact that the Jordanian government in spite of all
60 the efforts, cannot ensure sufficient food supply for the increasing population without
61 international help, many international food-aid organizations such as Action against
62 Hunger and The World Food Program participate in attaining food security in Jordan
63 (Mousa, 2020; WFP.org, 2022; actionagainsthunger.org, 2022).

64 Also, as humans are part of the ecological system that does not sustain without
65 natural resources and due to our responsibility towards the mother earth, society and
66 next generations, researchers are progressively studying methods to achieve business
67 goals while serving society and reducing the negative impact on the environment.
68 Therefore, many concepts related to sustainable business emerged, such as sustainable
69 supply chain, reverse logistics, environmentally- friendly supply chain and green
70 supply chain (Abidi et al., 2017).

71 Moreover, a significant challenge threatening people's lives and economic
72 stability across the globe is food security; especially during the adversities we are facing
73 nowadays, such as COVID-19, climate change and scarcity of natural resources which
74 represent growing concerns for government agencies and organizations around the
75 world; as they negatively impact food sources such as agriculture, and threaten millions
76 of people's access to food supply (Paslakis, 2021; Rasul, 2021; IPCC, 2019; Watts et
77 al., 2020; Ching & Kajino, 2020).

78 Thus, it is crucial that researchers create paths of survival to the nations with
79 findings which aid policymakers and businesses in implementing strategies, policies
80 and programs that can lead to reaching food security through environmentally
81 sustainable management models.

82 Therefore, this research aimed to explore the roles and practices of international
83 retailers in implementing sustainable supply chains to attain food security in Jordan.

84 **Problem Statement**

85 A world where more than enough food is produced but millions of people die out of
86 hunger each year needs major changes to ensure every food item is reserved for its
87 correct use. Demand on food is increasing as world population increases, and the food

88 lost throughout the food supply chain everyday could have been on the dining table of
89 many people.

90 Also, waste generated from food items and food packaging contributes a
91 significant amount of greenhouse emissions to climate change, and it does not only
92 imply the loss of food but also the waste of the water, energy and time used to produce
93 all the amounts of food, which means more efforts are needed to ensure reducing food
94 loss and food waste through better management of the food supply chain in a
95 sustainable way.

96 Therefore, to aid international food retailers in overcoming the sustainability
97 and food security challenges, this research pointed these problems as areas that can be
98 improved by international food retailers practices to increase their awareness of their
99 role in implementing sustainable supply chains and their role in attaining food security
100 in Jordan, especially when Jordan is facing additional pressure of meeting not only the
101 increasing demand of citizens but also the refugees despite the lack of resources.

102 **Research Purpose and Objectives**

103 The main purpose of this research study is to identify the roles and practices of
104 international retailers in implementing sustainable supply chains through four
105 dimensions (Responsible packaging, reduce, redistribution, recycle) in attaining food
106 security in Jordan. To fulfil this aim, several objectives have been addressed:

- 107 • To explore:
- 108 1. How far international food retailers in Jordan implement sustainable supply
109 chain practices
 - 110 2. How far international food retailers contribute to attaining food security in
111 Jordan
 - 112 3. The role of four sustainable supply chain practices (Responsible packaging,
113 reduce, redistribution, recycle) in attaining food security in Jordan

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115
116
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- 118 • To provide:
- 119 1. A sustainable supply chain model that can be implemented in food retail
- 120 sector
- 121 2. Recommendations that can help international food retailers gain the
- 122 benefits of implementing sustainable supply chains and support
- 123 policymakers in achieving food security by implementing sustainable
- 124 supply chains in the food retail sector.
- 125 3. Bases for further research on the role of sustainable supply chains in
- 126 attaining food security in Jordan

127 **Research Hypotheses**

128 To answer the research questions, the following hypotheses were developed:

129 **Main Hypotheses**

130 H0: Implementing sustainable supply chain practices by international food retailers has

131 no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

132 Based on sustainable supply chain dimensions, the main hypothesis was divided into

133 the following

134 **Sub Hypotheses:**

135 H01: Implementing responsible packaging practices by international food retailers

136 has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

137 H02: Implementing reducing food loss and food waste practices by international food

138 retailers has no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

139 H03: Implementing food redistribution practices by international food retailers has

140 no role in attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

141 H04: Implementing recycling practices by international food retailers has no role in

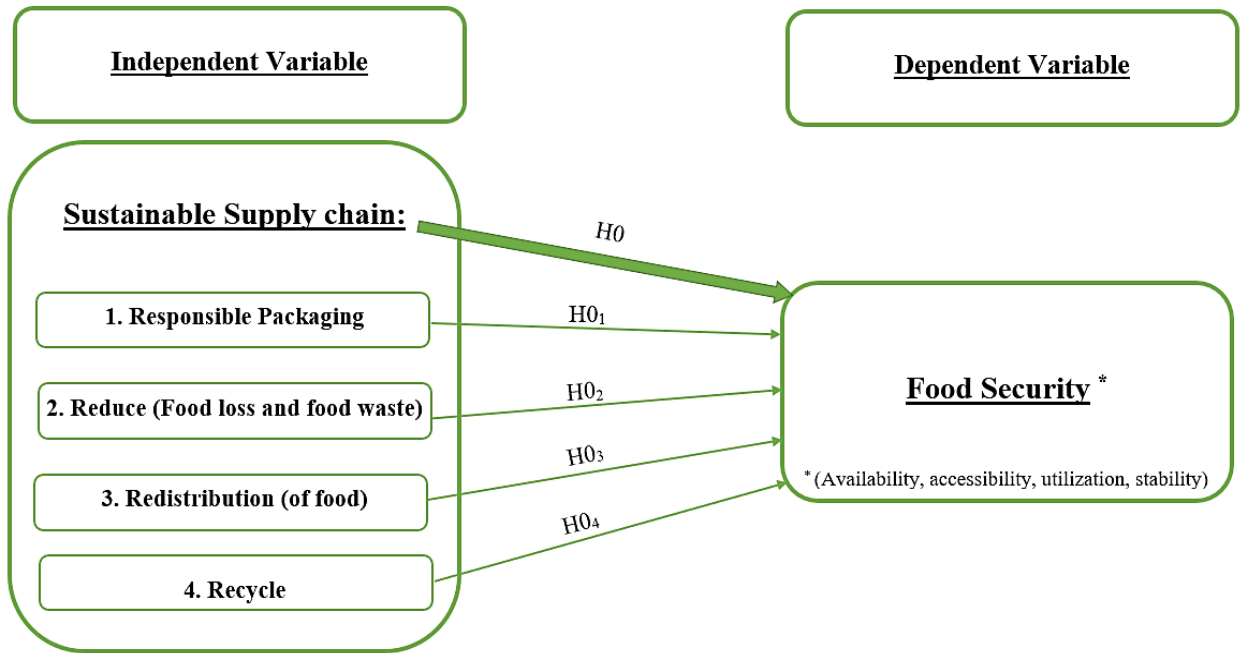
142 attaining food security in Jordan at level of significance ($\alpha \leq 0.05$)

143

144

145 **Conceptual Framework**

146 *The research study model*



147 This model was developed by the researcher based on previous studies

148 The overview of related literature provided in this research, concludes that
149 researchers' interest in sustainability increased by the influence of the Triple Bottom
150 Line concept emergence. Therefore, they started investigating the links between
151 sustainability and different business practices which led to the development of
152 sustainable supply chain concept, where many supply chain practices are viewed from
153 an environmentally friendly perspective.

154 Most research studies that focused on sustainable supply chain practices,
155 investigated those practices either in production stage, distribution stage or
156 consumption stage. Therefore, the various models presented to describe sustainable
157 supply chain practices were most fitted to the contexts of their studies which led the
158 researcher of this study to present a model that would fit the food retail sector so that it
159 can be used to investigate the role of these specific four dimensions of sustainable
160 supply chains in attaining food security from a managerial perspective despite the fact

161 that food security is mostly explored through studying consumers rather than food
162 retailers.

163 Understanding the roles of sustainable supply chain practices in food security should
164 lead to better decision making in food retail sector and more collaboration between
165 governmental institutions and food retailers, which can result in better allocation of
166 resources and a step further towards higher food security.

167 **Research Design**

168 This research followed a quantitative-descriptive approach. Primary data was collected
169 from employees with managerial positions in international food retail stores in Jordan,
170 through self-completion questionnaires, in a non-contrived setting and no interference
171 with the normal work routine. The International food retail stores have been selected,
172 believing that those stores have a documented operations procedures and work based
173 on international standards.

174 **Statistical techniques in data analysis**

175 Data collected from the sample was analyzed using SPSS. The tests included frequency
176 distribution for demographic analysis, descriptive statistics such as Mean and standard
177 deviation to provide basic information about variables and potential relationships
178 between them, reliability analysis through Cronbach Alpha value, correlation analysis
179 through correlation matrix, multicollinearity test and multiple regression analysis to test
180 the hypotheses.

181 ***Population***

182 International food retail stores were the field of this research, the population consisted
183 of four hundred and eight (408) employees with managerial positions in four
184 international food retail brands in Amman-Jordan (53 stores).

185 ***Sample and sampling techniques***

186 A purposive sampling technique was used to select certain employees with managerial
187 positions from four international food retail stores in Jordan (Carrefour, Cozmo,

188 Safeway, and C-Town), who have direct engagement in the sustainable supply chain
189 practices included in the research model.

190 **Procedure of data collection**

191 Data from employees with managerial positions in international food retail store in
192 Amman-Jordan was gathered through personally administered self-completion
193 questionnaires as a source of primary data.

194 The researcher obtained lists of employees who have direct experience in supply chain
195 management from human resources departments of the selected food retail brands and
196 booked meetings with the employees to distribute the questionnaire and provide
197 answers to the employees inquires (if any).

198 Although the procedure of data collection took a long time due to COVID-19 and its
199 implications on companies' guidelines, the researcher ensured that the questions were
200 clear to respondents and the process of filling the questionnaire had no issues.

201 **Overview of respondents' profile**

202 Among the total number of respondents, 70% were male which implies that female
203 employees who hold managerial positions related to supply chains are less than males.
204 Most of respondents belonged to the age group of (30 – less than 40) and the least
205 number of respondents belonged to the age group of (50 or above) which represent the
206 overall characteristic of Jordanian society, which has one of the youngest populations
207 in the world and implies that employees in Jordan food retail sector are mostly under
208 the age of forty (40).

209 Also, among all respondents, around 48% were managers while the least percentage of
210 respondents were directors due to the fact that there are fewer directors in each food
211 retail brand in comparison with other employees, and that it was difficult to contact
212 some of the directors due to their busy schedules. This also justifies that the majority
213 of respondents were younger than 40 years old as they were mainly lower and middle
214 level managers rather than top management such as directors.

215 In terms of the size of retail store, Large and medium shaped were nearly equally
216 observed since each of the international food retail companies targeted by the
217 questionnaire has more large branches such as hypermarkets and fewer small branches
218 such as “Express” and “Simply.”

219 **Descriptive analysis**

220 The descriptive analysis includes mean and standard deviation. Mean value analysis,
221 which is a measure of central tendency, indicates that there is a moderate to high level
222 of implementation of Responsible packaging, reduce and recycle and an above
223 moderate food security level in international food retail stores in Jordan, while the level
224 of implementing Responsible packaging is relatively low since “Reduce” generates the
225 highest mean value 3.67 and “Food redistribution” obtained lowest average value,
226 which is 2.76.

227 Also, standard deviation ranged between 0.87 for food redistribution practices and 1.25
228 for reducing food loss and food waste practices, which implies that although food
229 redistribution practices are implemented less than other practices, their implementation
230 is more consistent than the other practices even when they are implemented more.

231 **Results Pertaining Hypotheses**

232 Multiple regression analysis was used to test the research hypotheses:

233 **H0: Implementing sustainable supply chain practices by international food**
234 **retailers has no role in attaining food security in Jordan at level of significance (α**
235 **≤ 0.05)**

236 The results of multiple regression analysis of the four (4) dimensions of sustainable
237 supply chain against food security, showed that R square = 0.917, which indicates that
238 the four variables of this research model of sustainable supply chain have roles in
239 explaining the variation in the dependent variable (Food Security) as the adjusted R
240 Square = 0.915, when multiplied by 100%, the value of adjusted R Square will be
241 91.5%. This percentage indicates that 91.5% of the variation in Food Security levels is

242 due to the implementation of Sustainable Supply Chain practices investigated in this
243 research study.

244 Therefore, the main null hypothesis (H_0) of this research is rejected and the alternative
245 hypothesis which states that Implementing sustainable supply chain practices by
246 international food retailers has a role in attaining food security in Jordan at level of
247 significance ($\alpha \leq 0.05$) is accepted.

248 As the purpose of ANOVA in this research is to detect whether there is a significant
249 relationship between food security and Responsible packaging, reduce, redistribution
250 and recycle, the p-value (sig) = 0.000 which is less than 0.05 and highly significant, the
251 F test rejects the null hypotheses that state that there are no roles of implementing the
252 4Rs model in attaining food security in Jordan. Since $F = 376$, it is concluded that it is
253 not possible that the variation occurred by chance.

254 The constant = 0.23 which is the estimate of Beta_0 which has a (Sig) = 0.000, which is
255 highly significant. This estimate indicates that the average value of Food Security
256 would be 0.23 if no sustainable supply chain practices were implemented.

257 The unstandardized coefficient of “Responsible Packaging” practices is 0.168, which
258 is significant at 1% level of significance and indicates that if international food retailers
259 increase implementing Responsible packaging practices in their stores by 1 unit, food
260 security will increase by 0.168 units, keeping other variables consistent.

261 Therefore, the null hypothesis (H_{01}) that states that Implementing responsible
262 packaging practices by international food retailers has no role in attaining food security
263 in Jordan at level of significance ($\alpha \leq 0.05$) is rejected. It can be concluded that
264 implementing responsible packaging practices by international food retailers has a
265 significant role in attaining food security in Jordan

266 Also, the unstandardized coefficient of “Reduce” practices is 0.476, which is also
267 significant at 1% level of significance and indicates that if international food retailers
268 increase implementing reducing food loss and food waste by one unit, food security
269 will increase by 0.476 units, keeping other variables consistent.

270 Therefore, the null hypothesis (H_{0_2}) that states that Implementing reducing food loss
271 and food waste practices by international food retailers has no role in attaining food
272 security in Jordan at level of significance ($\alpha \leq 0.05$) is rejected.

273 Moreover, the unstandardized coefficient of “Food redistribution” is 0.121, which is
274 significant at 1% level of significance and indicates that if international food retailers
275 increase implementing food redistribution practices by one unit, food security will
276 increase by 0.121 units, keeping other variables consistent.

277 Therefore, the null hypothesis (H_{0_3}) which indicates that Implementing food
278 redistribution practices by international food retailers has no role in attaining food
279 security in Jordan at level of significance ($\alpha \leq 0.05$) is rejected. And it can be concluded
280 that implementing food redistribution practices by international food retailers has a role
281 in attending food security in Jordan.

282 As for Recycling practices, Beta = 0.255, $p < 0.01$. which indicates that if international
283 food retailers increase implementing recycling practices by one unit, food security will
284 increase by 0.255 units, keeping other variables consistent.

285 Thus, the null hypothesis (H_{0_4}) which indicates that Implementing recycling practices
286 by international food retailers has no role in attaining food security in Jordan at level of
287 significance ($\alpha \leq 0.05$), is rejected, since implementing recycling practices in
288 international food retailers has a significant role in attaining food security in Jordan.

289 **Summary of results**

290 Results of the conducted analysis can be concluded as follows:

- 291 • All the null hypotheses of this research were rejected as it has been statistically
292 proven that all the investigated dimensions of sustainable supply chains
293 (Responsible packaging, reduce, redistribution, recycle) had significant roles in
294 attaining food security
- 295 • Although all the sustainable supply chain practices of the 4Rs model in this
296 research had positive roles in attaining food security. “Reduce” had the most
297 significant role while “food redistribution” had the least significant role.

- 298 • The level of implementing “Reducing” practices in international retail stores in
299 Jordan was the highest amongst the other sustainable supply chain practices,
300 while “Food redistribution” practices were the least implemented practices.
301 • Implementing “Reduce” practices process was not consistent which may lead
302 to difficulties in measurement and inconsistency of the level of implementation
303 on the long-term bases

304 **Discussion of results**

305 This research concluded that implementing sustainable supply chain practices
306 especially responsible packaging, reduce, redistribution and recycle, by international
307 food retailers, have significant roles in attaining food security in Jordan which came in
308 accordance with the (Kuiper & Cui, 2021) study, which concluded that food loss
309 reduction efforts in processing and production stages have strong impact on food
310 security and environment.

311 Also, the results shed lights on the role of food redistribution practices in food
312 retail sector in Jordan, in attaining food security by reducing food loss and food waste,
313 which was in line with (Bergstrom et al., 2020) study, which presented food
314 redistribution as a solution for the amounts of food surplus in retail sector in Sweden.

315 Moreover, linking sustainable supply chain practices and food security in this
316 research was in harmony with many research studies such as (Krishnan et al., 2020;
317 Chan et al., 2020) where researchers called for redesigning food supply chains and food
318 security initiatives to become more environmentally sustainable.

319 Furthermore, researchers who investigated food security in Jordan such as
320 (Khader et al., 2019) encouraged research on various sources of food loss and waste
321 throughout supply chains to provide solutions that can contribute to reducing the
322 amounts of food wasted, therefore, the researcher of this study believes that the insights

323 provided by this research on sustainable supply chain practices in food retail
324 sector in Jordan and the presented 4Rs model should be useful for decision makers.

325

326

327 **Recommendations**

- 328 • This research recommends implementing Sustainable supply chain practices to
329 international food retailer in Jordan, as the literature shows the benefits of these
330 practices for the society, environment, and the business itself, also, as the results
331 of the research analysis concluded that implementing these practices has a positive
332 role in attaining food security in Jordan
- 333 • Although implementing one of the dimensions of sustainable supply chain
334 (Reduce) has the most significant role in attaining food security in Jordan, it is
335 recommended that international food retailers implement the dimensions of the
336 4Rs model presented in this research as they all proved to have significant roles in
337 attaining food security in Jordan
- 338 • Governmental institutions in Jordan are advised to encourage Sustainable supply
339 chain practices in the food retail sector as it has a positive influence on a national
340 goal which is attaining food security
- 341 • International food retailers in Jordan, are advised to improve their links with food
342 banks and non-governmental entities to implement more food redistribution
343 practices
- 344 • This research studied only four dimensions of Sustainable supply chains, whereas
345 there are many other dimensions such as recover, reuse, reform, repair,
346 remanufacturing, low carbon logistics, life cycle analysis and energy efficiency,
347 which can be investigated, and their relationship with food security can be studied.
- 348 • This research focuses on the sustainable supply chain practices in the international
349 retail sector in Jordan. Local food retailers' practices can be investigated in future
350 research, also, sectors other than the retail sector in Jordan can be studied.
- 351 • The same areas of this research can be investigated but in other geographical areas
352 than Jordan such as countries in the Mediterranean region
- 353 • Future research is encouraged to use other methods of data collection such as,
354 interviews, to have more in-depth insights on the research topic, since many
355 conditions could affect the implementation of sustainable supply chain which is a
356 matter that involves various parties such as government institutions, health
357 institutions and policy makers in food retail stores