Navigating Disruptions: The Role of Sustainable Practices in Enhancing Resilience in Upstream Agricultural Supply Chains

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Abstract

Sustainability and resilience are key objectives for managing upstream agricultural supply chains, especially in the face of increasing disruptions from factors such as climate change, geopolitical instability, and logistical challenges. This thesis examines the relationship between sustainable practices and supply chain resilience, with a focus on agricultural commodities such as coffee, cocoa, tea, and spices. Through interviews with industry experts, this research identifies effective and ineffective sustainable practices for managing disruptions and highlights the trade-offs and alignments between sustainability and resilience. The findings suggest that many sustainable practices, such as farmer training, biodiversity, and fostering supplier relationships, improve resilience. However, there are also trade-offs; for example, while direct procurement and guaranteed purchase quantities strengthen sustainability, they can conflict with the resilience capability of sourcing flexibility. Additionally, this thesis argues that the concept of recovery commonly used in resilience definitions is often inappropriate for upstream agricultural supply chains, as there are situations where recovery is not feasible. Limitations such as geographical focus and commodity-specific insights are acknowledged, pointing to future research opportunities to generalize the findings and integrate quantitative methods. Overall, this thesis highlights the importance of developing strategies that keep supply chains both sustainable and resilient in an increasingly unpredictable global landscape.

Keywords: Supply chain resilience, Agricultural supply chains, Disruptions in supply chains, Sustainable practices, Upstream supply chains, Climate change, Sustainability trade-offs, Resilient practices, Recovery from disruptions

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Resumo

A sustentabilidade e a resiliência são objetivos essenciais para a gestão das cadeias de suprimento agrícolas a montante, especialmente diante do aumento das perturbações causadas por fatores como mudanças climáticas, instabilidade geopolítica e desafios logísticos. Esta tese examina a relação entre práticas sustentáveis e a resiliência das cadeias de suprimento, com foco em commodities agrícolas como café, cacau, chá e especiarias.

Por meio de entrevistas com especialistas do setor, esta pesquisa identifica práticas sustentáveis eficazes e ineficazes na gestão de perturbações, destacando os trade-offs e alinhamentos entre sustentabilidade e resiliência. Os resultados sugerem que muitas práticas sustentáveis, como treinamento de agricultores, preservação da biodiversidade e fortalecimento das relações com fornecedores, aumentam a resiliência. No entanto, também há trade-offs; por exemplo, enquanto a aquisição direta e as quantidades de compra garantidas reforçam a sustentabilidade, podem entrar em conflito com a flexibilidade de sourcing, uma capacidade essencial para a resiliência.

Além disso, esta tese argumenta que o conceito de recuperação, comumente usado em definições de resiliência, muitas vezes não é adequado para as cadeias de suprimento agrícolas a montante, já que há situações em que a recuperação não é viável. Limitações como o foco geográfico e os insights específicos de determinadas commodities são reconhecidas, apontando para oportunidades de pesquisas futuras que generalizem os achados e integrem métodos quantitativos.

De forma geral, esta tese destaca a importância de desenvolver estratégias que mantenham as cadeias de suprimento sustentáveis e resilientes em um cenário global cada vez mais imprevisível.

Palavras-chave: Resiliência da cadeia de suprimentos, Cadeias de suprimentos agrícolas, Interrupções nas cadeias de suprimentos, Práticas sustentáveis, Cadeias de suprimentos a montante, Mudanças climáticas, Compensações de sustentabilidade, Práticas resilientes, Recuperação de interrupções

Título: Navegando por Interrupções: O Papel das Práticas Sustentáveis na Melhoria da Resiliência nas Cadeias de Suprimentos Agrícolas a Montante

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1 Introduction

With a growing population, global supply chains, particularly food supply chains, are becoming increasingly important. By 2024, the global food market is projected to reach a value of $9.12 trillion, with an annual growth rate of 6.7%. The supply chains responsible for transporting goods from farms to consumers are known for their complex nature (World Economic Forum, 2024). On the one hand, agricultural supply chains are coming under increasing pressure due to growing disruptions such as extreme weather caused by climate change, logistical challenges, and political issues. On the other hand, the need for sustainability is becoming increasingly critical (Gupta, 2024; Race & Josephs, 2024; Savage et al., 2024; Holger, 2023; Munk, 2022). Therefore, demonstrating methods to integrate resilience against disruptions and sustainability into supply chains has become significantly more important. This is relevant for all stakeholders in the upstream supply chain, ranging from producers and traders to policymakers. Understanding which sustainable practices genuinely enhance resilience could help businesses make informed decisions, improving not only supply chain stability but also better sustainable outcomes. In response, this research aims to explore within an industry-specific context: why do some sustainable practices in upstream agricultural commodity supply chains foster more effective recovery from disruptions, while others do not?

Organizations recognize the importance of understanding the relationship between resilience and sustainability. However, academic literature offers conflicting views on the role of sustainability in enhancing supply chain resilience (Arimany-Serrat et al., 2024; Negri et al., 2021). Although both concepts are often highlighted as key strategic goals in supply chain management, the relationship between practices of those two concepts remains underexplored. Research has called for more studies to examine the synergies and trade-offs between resilience and sustainability practices, including how they are perceived by organizations. Additionally, the role of sustainable sourcing in enhancing supply chain stability and addressing environmental concerns is a growing area of interest, with future studies encouraged to investigate how supplier involvement strategies contribute to promoting sustainability across supply chains (Cotta et al., 2023; Raman et al., 2023).

Through interviews with 15 experts in the field, I collected qualitative data and, using grounded theory, gained insights into sustainable practices, disruptions, and effective and ineffective approaches to managing said disruptions in the upstream supply chain of agricultural commodities. Participants were selected based on their expertise, the supply chain roles of their

companies, and involvement with commodities such as coffee, cocoa, tea, and spices. For the qualitative research methodologies, I followed Corbin & Strauss (1990) and Gioia et al. (2013). Comprehensive tables present the findings on sustainable practices implemented in the upstream supply chain, the disruptions affecting its operations, and their respective consequences and impacts. Frequently mentioned sustainable practices include farmer training in origin countries and supplier-led projects. Disruptions often impacting supply chain functionality are primarily climate-related and logistical in nature, among others. Additional information is provided on factors influencing the implementation of practices, regulations, and actions taken in response to disruptions. A third table summarizes interviewees9 perspectives on effective and ineffective practices for managing disruptions, many of which are related to climate change, such as research on resilient crop varieties and measures to combat plant diseases. Finally, the trade-offs between resilience and sustainability are examined, highlighting challenges such as financial constraints and flexibility in sourcing, which often conflict with sustainable requirements. Strong alignments between sustainability and resilience can be achieved through practices such as building strong relationships between stakeholders, research, and transparency.

As for theoretical contributions this thesis explores the complex relationship between sustainability and resilience in agricultural supply chains, addressing the lack of consensus on whether these constructs are compatible or conflicting. It discusses the concept of recovery, demonstrating that traditional notions are often impractical in the context of agricultural disruptions. Additionally, it provides a framework for effective and ineffective practices, linking resilience and sustainability capabilities to guide future research and applications. This study has limitations which affect generalizability, including a focus on specific supply chain aspects, potential biases from companies emphasizing traceability, and a geographic and commodity concentration on Germany and coffee supply chains. Future research should encompass more diverse samples, perspectives from farmers, and integration of quantitative methods to assess practices9 effectiveness. Additionally, expanding research to internal and downstream supply chains could provide a fuller understanding of resilience and sustainability.

The following chapter covers the theoretical discussion, followed by the methodology and data analysis. It concludes with a summary of the findings, a discussion of their implications for theory and practice, and suggestions for future research, as well as an acknowledgment of the limitations of the thesis.

2 Theoretical Discussion

2.1 Definition and Scope of Supply Chains

A supply chain can be understood as encompassing the activities, tools, data, materials, human resources and other essential resources necessary to define, manufacture, transform, construct, and deliver a service or product from the producer to the consumer. Within this system, three phases can be distinguished, each consisting of smaller components of the supply chain: the first is *procurement*, which includes, for example, decisions on the sourcing of raw materials and components for production. This is followed by *production*, which refers to the manufacturing process where the final product is created. Finally, *distribution* includes all activities to deliver the product to the buyer (Solari et al., 2024). The different phases can also be referred to as upstream, internal and downstream supply chain of a company (Herrmann et al., 2021).

2.2 Sustainability in Supply Chains

2.2.1 Sustainable Supply Chain Management

Sustainability is a broad concept that is not universally defined (Negri et al., 2021). Due to its scope, sustainability is often refined into specific parameters. Some frameworks organize sustainability into these three pillars: environmental, social, and governance (Arimany-Serrat et al., 2024). Other common dimensions are environmental, social and economic, often referred to as the triple bottom line (Elkington, 1998). For instance, a contribution to sustainability can be a quality of processes, products or services that limit the consumption of resources and the production of waste to a sustainable level, which helps to meet essential human needs and create long-term economic value for a company (Fiksel, 2015). In what follows, I consider sustainability in supply chains through the environmental, social, and economic dimensions rather than another view of sustainability in supply chains, which focuses on the ability to maintain uninterrupted operations despite limitations in infrastructure, resources, and capacity (Speier et al., 2011). Two concepts that address sustainability in the supply chain are Sustainable Supply Chain Management (SSCM) and Green Supply Chain Management (GSCM). Both SSCM and GSCM are defined in various ways, and the terms are regularly used interchangeably despite differences according to some definitions (Herrmann et al., 2021; H. Holling & Backhaus, 2023). Historically, GSCM began to take shape in the 1960s and gained momentum in the 1990s (Fahimnia et al., 2015). Strategies such as pollution reduction measures

and the relocation of hazardous operations to developing regions were among the first responses to environmental challenges. GSCM typically emphasizes the integration of environmentally responsible practices across procurement, management and various operational stages (Ojo et al., 2022). SSCM is often seen as a broader approach that seeks to increase profitability while simultaneously reducing environmental impact and promoting the social welfare of all stakeholders (Herrmann et al., 2021; Hassini et al., 2012). Across various definitions of SSCM, the three dimensions - environmental, social, and economic - are frequently highlighted, along with the critical role of cooperation, coordination, and collaboration within the supply chain (Sánchez-Flores et al., 2020).

2.2.2 Sustainable Practices

Given the multifaceted nature of GSCM, scholars have identified a wide range of practices focusing on different dimensions and categories (Ojo et al., 2022; Herrmann et al., 2021). The broad scope of these practices highlights the diversity within the field and underscores that SSCM remains a concept subject to ongoing debate and interpretation (Negri et al., 2021). Overall, focusing on the practices that collectively define GSCM or SSCM offers deeper insights into the challenges of implementing GSCM and its consequences.

For instance, a practice that contributes to GSCM is green purchasing. It is defined in multiple ways by scholars and may include specifications for suppliers, environmentally friendly packaging, supplier selection and audits, and the evaluation of second-tier suppliers (Herrmann et al., 2021). Green purchasing often involves not only assessing suppliers9 environmental performance but also committing to assist in enhancing it. Closely related to green purchasing is another practice, green procurement, which is a set of organizational methods aimed at selecting suppliers that have eco-design capabilities, technical expertise, strong environmental performance, and the ability to support a company9s sustainability targets. Essentially, green procurement is about incorporating environmental and social considerations into a company9s sourcing and purchasing standards alongside economic factors (Proença et al., 2022).

A variety of frameworks have been proposed to categorize the different GSCM practices such as green purchasing and green procurement, many of which include similar classifications. A comprehensive overview by Herrmann et al. (2021) provides an overview over practices for the upstream phase of the supply chain, the strategic topics include environmental strategy, supplier cooperation (e.g., support and education, joint ventures) and communication (flow of information), among others. Generally, the following key areas can be synthesized from several approaches: orientation towards environmentally friendly suppliers (e.g., collaboration with

them), eco-design (e.g., environmentally friendly product innovations), focus on environmentally friendly customers (e.g., collaboration with those and logistics), and a production that, for example, reduces pollution and waste (Holling & Backhaus, 2023).

2.3 Supply Chain Resilience

In numerous organizations, logistics functions, such as the supply of raw materials, are outsourced to partners. This global network has led to an environment dependent on supply chains, where disruptions can have a far-reaching impact. With supply chain risks growing, companies must increasingly focus on developing logistics processes and capabilities that enable them to respond swiftly and effectively to disruptions, ensuring the continuity of their operations as planned (Ponomarov & Holcomb, 2009). In other words, in today9s constantly changing world, organizational adaptability is an essential factor for success (Bernabei et al., 2022).

In the context of supply chain management there are numerous definitions of resilience (Negri et al., 2021). A comprehensive definition of supply chain resilience describes it as <The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function= (Ponomarov & Holcomb, 2009, p. 131). A more specific definition in the context of this thesis would be the agri-food supply chain definition by Stone and Rahimifard (2018). They characterize it as the combined capacity of stakeholders within the agri-food supply chain to maintain adequate and consistent food availability at the specified times and places. This is achieved through effective anticipation of potential disruptions, implementing strategies that mitigate immediate effects, support swift recovery, and enable continuous learning after disruptions occur.

Supply chain resilience is a crucial operational and managerial capability for organizations. It allows members of the supply chain to recover swiftly, potentially leading to significant growth. This resilience empowers companies to effectively handle external shocks, for example market volatility or natural disasters (Zhang et al., 2024). Further examples of key risks that can impact global supply chains are sudden shifts in demand, extreme weather events, disruptions in information and communication, and political instability (Fiksel, 2015). Therefore a distinct area of research has emerged, concentrating on identifying the factors that influence supply chain resilience (Arimany-Serrat et al., 2024). For instance, the capacity of the supply chain to recognize early indicators of change, plan for the most unforeseen outcomes, and react swiftly

and adaptably to disruptive situations can guarantee agri-food resilience. By being proactive, resilient firms may transform challenges into opportunities, implement creative solutions and gain a competitive edge over their competitors (Bernabei et al., 2022). In other words, while external causes (e.g. climatic, political, or health crises) influence resilience, internal management elements affect how businesses respond to carry on with business as usual (Camur et al., 2023).

The existing literature identifies two primary perspectives on supply chain resilience, namely core capabilities and management processes. From the core capabilities perspective, resilience is defined as the fundamental abilities that enable an organization to react effectively to disruptions, focusing on the key capabilities needed to manage uncertainty and change. In contrast, the management process perspective views resilience through the various stages involved in responding to disruptions, emphasizing the significance and interdependence of different phases within the supply chain management process (Zhang et al., 2024). Furthermore, supply chain resilience can be assessed through tools such as continuous monitoring, redundancies, transparency mechanisms, and strategies for recovery (Tarigan et al., 2021; Ivanov & Dolgui, 2021). Shifting from these theoretical perspectives, supply chain resilience practices can be classified as proactive, concurrent, or reactive, depending on the stage of the disruption (Ali et al., 2017; Negri et al., 2021). Anticipating disruption practices involve, among others, a risk management culture in the supply chain, agility, enhancing control and collaboration, visibility, design of the supply chain, improvement of capabilities and decentralization (Pettit et al., 2013; Negri et al., 2021; Christopher & Peck, 2004; Rajesh, 2019). To enhance resilience during disruptions, the implementation of practices such as flexibility in supply chains, redundancies, and postponement should be considered (Pettit et al., 2013; Negri et al., 2021). After a disruption occurs, the following practices might be helpful, among others: the capability to learn (e.g., managing and increasing knowledge, developing social capital) and to recover (e.g., market positioning, planning contingencies) (Ali et al., 2017). The list of practices is extensive and could easily be extended much further.

2.4 Integrating Sustainability and Resilience

Although sustainability and resilience are prominent research areas, they have primarily been studied independently. Furthermore, their integration within the context of supply chains remains relatively underexplored (Negri et al., 2021; Fahimnia et al., 2019). In other words, there is a lack of consensus among researchers on whether sustainability and resilience are independent, dependent, compatible or conflicting (Arimany-Serrat et al., 2024).

For Fiksel (2015), those two concepts are interdependent and complement each other. For instance, minimizing the environmental impact of the supply chain can protect organizations from the uncertainties associated with the unpredictability of climate. On the other hand, the greater the resilience of a system, the more it guarantees uninterrupted functioning, as it is less prone to disruptions that could impede progress in achieving the sustainability objectives. In consequence, efforts to enhance sustainability should consider the resilience of social and environmental systems, including their ability to adjust to shifting circumstances - such as commodity price fluctuations or rainfall patterns - and to withstand unforeseen disruptions like power outages or threats of terrorism. An organization must align its long-term sustainability objectives with the practical, instant ones of resilience. Sustainability and resilience are often considered interrelated, with some scholars asserting that sustainability inherently encompasses resilience, as it is crucial for adapting to unforeseen challenges and prospering amid change. However, it is also debated that resilience encompasses sustainability, as it is vital for maintaining equilibrium with environmental limits and social responsibilities. Summarizing, one could say that given their deep interconnection, organizations cannot approach resilience and sustainability as distinct strategies. An organization can pursue resilience through the main pillars of sustainability. Economic resilience involves the financial stability and wealth of the organization, incorporating the economic health and diversity of the regions it is active in, the supply chains it depends on, and the markets it operates in. Social resilience focuses on the human and social values within the company, such as the skills, cooperation and loyalty of its employees, the strength of its networks and the social and political unity of the communities in which it operates. Lastly, environmental resilience pertains to the organization9s ability to use resources efficiently, reduce waste, and maintain the ecosystems that it depends on (Fiksel, 2015). Resilience has also been associated with the degree of strategic alignment among the participants in a supply chain, demonstrating that collaboration between the different actors improves the overall strength of the entire system (Scholten & Schilder, 2015). As for practices that strengthen resilience and sustainability on the supply side, examples include building long-term relationships with suppliers, green purchasing, and the exchange of information (Negri et al., 2021; Teuscher et al., 2006; Hallikas et al., 2020).

However, organizations must recognize that these two topics can either exhibit synergies or involve trade-offs between them, as highlighted by researchers (Fahimnia et al., 2019). There are situations where there is a difference between a sustainable and a resilient decision, as they often have opposing goals (Fahimnia et al., 2018). For instance, strategies aimed at improving

efficiency and minimizing waste within the supply chain may align with environmental and economic goals. Yet, such approaches could potentially impact supply chain resilience by limiting the availability of safety stock needed, for example, to address fluctuations in supply and demand. Another trade-off that can happen is sustainable sourcing often involves working with a smaller set of high-performing suppliers, prioritizing sustainability criteria. While this fosters trust-based relationships and greater transparency, it can limit flexibility to switch suppliers during crises, highlighting trade-offs between stronger partnerships and reduced adaptability. Also, with circular economy, a sustainable practice, it is debatable whether it increases supply chain resilience (Fahimnia et al., 2019). More generally speaking, as highlighted by Rajesh (2021), the opposing goals between resilience and sustainability in the supply chain can be summarized as six kinds of contradictions. The first is efficiency versus flexibility, as already mentioned. The second involves streamlined processes to minimize waste versus the ability to quickly adjust output. The third is reverse logistics versus reduction of complexity; while reverse logistics increases buffer capacity and supports sustainability, it adds complexity to supply chains, whereas resilience benefits from reducing said complexity. Another contradiction is resource conservation versus redundancy: sustainability emphasizes conserving resources, whereas resilience relies on redundancy to handle uncertainties. The two final ones are adaptability versus competency, where sustainability demands adaptability to future markets, while resilience focuses on maintaining current operational competencies. Social and environmental risk versus vulnerability reduction is another trade-off: sustainable supply chains often prioritize social and environmental risk management, while resilient supply chains focus on reducing economic vulnerabilities. These differing focuses can lead to conflicting priorities in supply chain decision-making (Rajesh, 2021).

Despite extensive research on sustainability and resilience in supply chains, the integration of practices of these two critical concepts remains insufficiently understood. While the literature identifies numerous practices and trade-offs, it does not provide a clear answer on how practices can effectively integrate resilience and sustainability or why such integration may prove impossible in certain circumstances. This thesis seeks to address this gap by raising a central question: Why do some sustainable practices in upstream agricultural supply chains foster effective recovery from disruptions while others do not? This inquiry aims to explore the nuanced dynamics at play, offering insights within an industry-specific context.

3 Methodology

I address the research question of this paper, <Why do some sustainable practices in upstream agricultural commodity supply chains foster more effective recovery from disruptions, while others do not?=, by comparing the current state of literature on sustainable supply chain management, focusing on sustainability-related practices and resilience, with real-life insights gained through interviews with experts in their respective fields. Given that the intersection of sustainability and resilience is a nascent field, to enhance understanding of this problem and dive deeper into the topic, I adopt an exploratory approach. For this, I conducted interviews to collect qualitative data, aiming to identify patterns and gain deeper insights into the research problem (Edmondson & McManus, 2007).

3.1 Research Sample and Data Collection Method

I selected the interview partners based on the following criteria: the department they work in, their company9s role in the supply chain, and the kind of commodity they deal with. The focus was on soft commodities to facilitate better comparisons of the interviewees9 experiences. All interviewees have several years of experience within their respective commodity value chains. Additional details about the interviewees can be found in 8.1 Appendix A.

Due to time limitations, convenience sampling was employed. This approach relied on practical considerations, such as accessibility and the willingness to take part in the interviews, to determine the final sample. To be more precise, I used purposive sampling to deliberately select participants based on their expertise, experience, and relevance to the research topic. This nonrandom technique was chosen to identify individuals who could provide valuable insights (Etikan, 2016). To minimize bias, a significant number of interviewees with different professional backgrounds was selected to capture a wide range of different perspectives (Eisenhardt & Graebner, 2007). Overrepresentation might be due to personal connections, interviewees situated in Germany, and experts in the coffee supply chain. I conducted the interviews in English and German. In my method, I use the term SSCM, as it is more widely accepted in the industry and, therefore, more appropriate in the context of the interviews conducted for this thesis.

The interviews were conducted via Microsoft Teams to avoid geographical restrictions and allow for interviewing a more diverse set of experts. As the main objective of the interviews was to gain insights into the interviewees9 experiences with sustainable practices in the upstream supply chain, disruptions within the supply chain, and factors that aided the

management of those disruptions, semi-structured interviews were used because of their flexible character. Semi-structured interviews are especially suitable in this context, as they enable the interviewer to ask more open-ended questions, explore topics further, and gain insights into the perspectives of the experts interviewed (Adams, 2015). The questions were reviewed by an expert in this field who did not take part in the interviews. The guide for the questions can be found in 8.2 Appendix B. The duration of the interviews ranged from 40 minutes to 70 minutes. With the consent of the interviewees, the conversations were recorded, ensuring no data was lost for the subsequent analysis of the findings.

3.2 Data Analysis

To facilitate the analysis of the gathered data, the interviews were transcribed using a combination of manual transcription and automated software (Microsoft Word and Teams). For the analysis of the interviews, the process described by Gioia et al. (2013) was followed, with a focus on highlighting the perspectives of the interviewees and presenting their viewpoints in the findings, fostering opportunities to uncover novel concepts rather than merely reinforcing pre-existing ideas. For instance, interviewees were invited to describe what they perceive as disruptions in the upstream supply chain without being influenced by theoretical categories. During the data analysis, one interviewee was excluded from the study because their knowledge and expertise were not sufficiently relevant to the research focus. This decision ensured the validity and reliability of the findings by maintaining a focus on participants with appropriate knowledge of the upstream agricultural supply chain and its practices.

I used grounded theory analysis and applied open, axial, and selective coding in order to analyze the results and offer a meaningful contribution to the existing body of literature (Corbin & Strauss, 1990). MaxQDA software was utilized to facilitate the coding process. An overview of the coding can be found in 8.3 Appendix C. Given the data density, I condensed the overview to include three first-order codes per category and three categories per aggregated dimension. To give a comprehensive overview of the findings, tables were produced as suggested by Magnani & Gioia (2023). They not only enhance transparency regarding analysis and findings but also serve as effective tools for organizing and analyzing data systematically (Cloutier & Ravasi, 2021).

4 Results

4.1 Description of Companies

For this thesis, I interviewed a diverse group of professionals from various companies and organizations involved in agricultural supply chains. Participants represented multinational corporations, globally active traders, and organizations involved in sustainable supply chain initiatives. These professionals held roles such as heads of sustainability, procurement specialists, program managers, and traders, reflecting expertise across different commodities, including coffee, tea, cocoa, spices, and plant-based raw materials. The companies spanned a variety of sectors, including production, procurement, and ingredient solutions. There was a focus on companies that value traceability in their supply chains, as this focus was important for obtaining meaningful insights. As mentioned by Govindan et al. (2021), companies often face challenges in monitoring sustainability practices among tier-2 and higher-tier suppliers.

4.2 Sustainable Practices in Agricultural Supply Chains

I begin with the sustainable practices identified in the interviews and their consequences. Table 1 summarizes the most frequently mentioned second-order themes in the aggregated dimension of Sustainable Practices from the interviews, grouped by the column labeled <Category=. Specific examples of practices regarded as sustainable by the interviewees were assigned to their respective categories. These practices have a variety of consequences, most of them positive, as can be seen in the corresponding column.

4.2.1 Interview Findings and Connection to Previous Literature

While Table 1 presents findings on the ten most mentioned sustainable practice theories, I focus on the two that have stood out from the rest due to their common appearance throughout all interviews, ***training farmers***, and ***implementation of supplier-led projects***. Training farmers emerged as a key theme during the analysis of the interviews, highlighted by 11 interviewees. The interviewees discussed various forms of training and education, including the sharing of best agricultural practices, financial programs, and social education, such as guidance on treating employees ethically and determining appropriate tasks for children. They further pointed out that training of best practices can lead to improved quality and higher production of harvested commodities, resulting in better payments for farmers, to name some of the consequences that are summarized in Table 1. Another frequently mentioned topic was the implementation of supplier-led projects by the companies interviewed, sometimes carried out

in partnership with customers. Examples of such projects include support for female-led coffee cooperatives and other measures designed to improve the financial independence of women and help social inclusion.

Category	Examples for Practices	Examples for Consequences
Training of farmers	• Agricultural best practices • Agroforestry systems • Handling pesticides • Health of workers • Biodiversity • Financial training • Training on social topics • Income diversification	• Higher quality of products • Higher premium prices for farmers • Increased production • Farmers become more resilient to price fluctuations • Improved future perspective for people • Better treatment of workers • Reduced child labor
Projects	• Women's empowerment • Technological projects • Supplier-led programs as alternatives to conventional certifications • Microcredits • Commodities sourced from displaced persons • Infrastructure improvement	• Financial independence • More practical task distribution • Social inclusion • Reduced dependence on certifications • Enabling sustainable livelihoods for farmers • Increased production
Social Support	• Reduced child labor • Networking among farmers • Providing school materials • Access to schools and education • Measures to combat discrimination • Improved sanitation • Access to medical care	• Improved future perspectives for people
Emissions	• SBTi commitments • Efficient pesticide use • Improved production process • Adoption of modern technologies • Less deforestation • Increased digitalization • Partnerships • Enhanced transparency	• Emission reduction • Compliance to regulations like EUDR • Crop quantities • Impact on quality • Enhanced transparency
Certification	• Fairtrade • Rainforest Alliance • Enveritas • Organic • Demeter	• Paying premiums to farmers • Risk assessment • Addressing social aspects • Addressing environmental aspects • Performing audits • Improving productivity
Direct Contact	• Fixed purchase quantities • Reduced distances • Supporting farmers in decision-making • Providing technical assistance • Answering questions • Offering credits to favorable conditions • Building partnerships	• Knowledge of quality for purchasing companies • Ability to assist with specific problems • Improved risk assessment
Transparency	• Key Performance Indicators (KPIs) • Certifications • Increased digitalization • Improved traceability of raw materials	• Measuring Return on Investment (ROI) • Understanding the impact of actions taken, e.g., changes in production quantity • Eliminating specific deficits • Knowledge about the quality of goods • Improved risk assessment
Biodiversity	• Resource assessments • Agroforestry systems and shade trees • Polyculture systems (systems without monocrops)	• Customized actions tailored to specific conditions • Higher quality of products • Improved ecosystems • Emission reduction • Reduced soil erosion • Income diversification
Research	• Partnerships with universities • Development of KPIs • Measuring impact • Literature research • Research on traditional agricultural practices	• Development of best practices • Risk assessment • Adjustment of audits • Knowledge about the impact of actions
Regulations	• Examples: EUDR, LkSG, organic • Implementation of measures to comply with laws	• Reduction of carbon emissions • Improvement of social aspects such as discrimination, education, wages • Improved biodiversity

Table 1: Top 10 sustainable practice categories with examples and their consequences

I compare my observations with the existing literature to point out what appears to be in common with what we know and how practice may add to the scholarly conversation. While not all practices have been analyzed in detail against the literature, the emphasis is on uncovering overlaps and connections between the interview findings and documented concepts. I highlighted the concepts from Table 1 in bold and italics to facilitate the comparison.

The previously mentioned three dimensions of sustainability - social, environmental, and economic - are clearly interconnected in these practices. For instance, when farmers ***use pesticides effectively***, the ***quality of their goods improves***. This can lead to ***premium payments for their produce***, thereby ***enhancing their future prospects***. ***Efficient pesticide use*** additionally contributes to the ***reduction of emissions***, further highlighting the interconnectedness of certain practices.

The practices outlined by Herrmann et al. (2021) focus primarily on environmental aspects, with limited consideration of social and economic factors. Within the strategic dimension, ***supplier cooperation*** is included, encompassing ***support and education initiatives*** such as ***assisting with and training in the development of technologies to reduce negative environmental impact***, as well as adopting environmental ***certificates***. Green performance is

also highlighted in this dimension, featuring benchmarking, which is defined as the exchange of ***best practices*** among supply chain members. ***Training programs for suppliers*** are emphasized as a supporting factor for SSCM. Additionally, in literature, the concept of joint ventures aligns partially with the category of ***projects***, as defined here. Joint ventures are described as ***collaborative efforts*** where the purchasing company engages with its suppliers, forms joint teams, and ***establishes long-term programs*** aimed at creating environmentally friendly solutions (Herrmann et al., 2021). The reduction of negative environmental impacts and the broader goal of increasing sustainability through ***collaboration across supply chain members, including suppliers***, are widely explored topics in the scientific community (Tseng et al., 2019; Govindan et al., 2021). Within the operational dimension, practices such as ***emission reduction*** are noted. The category ***transparency*** described here aligns with the corresponding definitions of information flow and monitoring, as well as in the description of support factors mentioned by Herrmann et al. (2021).

On the social side, the literature identifies ***collaboration with suppliers*** as important for improving aspects related to ***human welfare***, ***fostering community development,*** and ***utilizing monitoring*** to incorporate management capabilities to drive social change (Cotta et al., 2023). Furthermore, multi-stakeholder initiatives, such as ***collaboration with universities***, can be seen as practices to enhance environmental, social, or economic performance. ***Certifications*** such as Fairtrade can also be considered practices with the objective of improving not only environmental sustainability performance in the supply chain (Koberg & Longoni, 2019).

4.2.2 Evolution and Challenges in Implementing Sustainable Practices

The interviews further indicate that these practices are neither established instantly nor applied universally. The interviewees described the evolution of sustainable practices in various ways. For instance, as stated by ID 3:

> *<Our approach to sustainability hasn9t changed much in the last five years. However, we were among the absolute pioneers in this field five years ago and are still benefiting from that. That said, it should also be fairly noted that other companies have now realized that it is no longer possible to do without it.= (ID 3)*

Generally speaking, the evolution of sustainable practices has evolved from a primary focus on certifications, particularly in the coffee sector, to emphasizing partnerships such as supplier-led programs, digitalization, and higher transparency. Over time, the focus has shifted from smallholder benefits to living income for farmers, climate change, carbon issues, regulations, and, more recently, the type of producers with whom companies work.

> *<In the past, the focus was on 8We need to work with smallholders to improve living conditions there.9 And now: Due to all the climate issues, it's now like, 8If you want to achieve something quickly, something you can measure, then it makes sense to work with large and more professional producers.9= (ID 6)*

The implementation of sustainable practices varies depending on the commodity and its context, as emphasized by the interviewees through examples of differing levels of scrutiny, funding, and local conditions. For instance, coffee and cocoa face high scrutiny, with strong demand and funding for compliance supported by NGOs and customers. In contrast, for other commodities like spices and nuts, lower retailer focus, and consumer demand reduce available resources for sustainability efforts. Additionally, the geographical origin of commodities significantly shapes the feasibility of implementing sustainable practices:

> *<You cannot implement every project in just any origin; the local conditions must always be taken into account.= (ID 3)*

Another perspective highlights the size of the farms where the commodities are produced as a differentiator:

> *<It is likely less about the commodity itself and more about the size of the farm & that9s the differentiating factor, regardless of whether it9s cocoa, coffee, bananas, or something else.= (ID 8)*

4.2.3 Regulations Shaping Supply Chain Sustainability

It would be only half the picture if regulations are not discussed explicitly, as they have non-trivial consequences for the development, implementation, and success of sustainability-related practices. Two prominent examples are the EU Regulation on Deforestation-Free Products (EUDR) adopted by the European Commission in 2023 and Germany9s Lieferkettensorgfaltspflichtengesetz (LkSG). The EUDR, on the one hand, focuses on specific commodities such as coffee, cocoa, and palm oil, as well as some products derived from these raw materials. Originally scheduled to take effect on December 30, 2024, its official start has been postponed by one year. The regulation aims to reduce global deforestation by obliging traders and operators within the supply chain to conduct detailed due diligence processes. The LkSG, on the other hand, which could be translated as the Act on Corporate Due Diligence Obligations in Supply Chains, came into effect at the beginning of 2023. It applies to companies with more than 1,000 employees and aims to ensure compliance with human rights in the global supply chain. Key objectives include guaranteeing fair wages, protecting the environment, and preventing child labor. This legislation is not only significant for Germany but also aligns with

broader European efforts. A similar regulation is the recently passed European Directive on Corporate Sustainability Due Diligence, which is set to take effect in 2027 for all EU companies. In addition to the regulations that directly affect the companies interviewed, there are also local regulations that have an impact on sustainability in the upstream supply chains, e.g., a ban on deforestation in China. (ID 12)

4.3 Disruptions in the Upstream Supply Chain and Their Impact

In this section, I focus on the disruption-related findings from my interviews. Table 2 serves to extract the most frequently mentioned second-order themes about disruptions from the interviews. For comparison, it follows the same structure as Table 1 on sustainable practices and classifies examples of disruptions and impacts for better illustration.

4.3.1 Interview Findings on Disruptions, their Interconnectedness, and Impact

There is one topic of disruption that outshines all others: All of the interviews included in the analysis referred to climate-related disruption, with 13 out of 14 explicitly emphasizing the effects of climate change.

> *<We no longer talk about climate change; personally, I only refer to it as a catastrophe. We9re experiencing it daily and intensely - it has made sourcing raw materials an extremely significant challenge.= (ID 14)*

As can be seen from Table 2, the overall picture includes numerous other disruptions in the field of logistics, covering a wide range of geographical areas and diverse thematic issues. Some disruptions intersect with other categories. For instance, pirates are listed under criminals and logistics categories as both areas are affected. Similarly, reduced water levels in the Panama Canal caused by climate change result in logistical challenges by restricting ship traffic.

Moreover, the disruptions and their impacts are closely interconnected. Table 2 highlights only the connections between disruptions and impacts drawn by the interviewees. However, it must be noted that the effects go beyond these direct implications. For example, a delay does not only mean an impact on logistics, additionally it leads to higher costs. Likewise, lower product availability is not only a problem in itself but also drives up prices, just like product quality being unfit for use leads to financial losses.

Category	Examples for Disruptions	Examples for Impacts
Climate	• Extreme rainfalls • Drought • Natural disasters (e.g. floods, hurricanes) • Insufficient water levels in the Panama Canal • Temperature drops • Crop diseases and pests • Shifts in seasonal patterns	• Risk of crop failure • Unpredictable risks • Shifts in growing regions • Reduced product availability • Decline in product quality • Increased prices • Loss of some producers • Delivery delays
Logistics	• Conflict surrounding Suez Canal • Container shortage (e.g. in Brazil) • Severe flooding • Insufficient water levels in the Panama Canal • Individual logistical challenges • Labor strikes • Pirates	• Delivery delays • Higher prices • Shifts in the attractiveness of certain origins • Reduced product quality • Increased uncertainty • Non-compliance with contracts
Criminals / Terrorists	• Pirates (e.g., East Africa) • Houthi rebels • Criminal activities (e.g., vanilla, lychee thefts) • Security challenges due to drug cartels	• Logistical problems • Export challenges (e.g., Ethiopia, Kenya) • Delivery delays • Ports excluded from shipping routes • Reduced product quality • Decreased product availability • Inability to travel to origin • Termination of projects / partnerships
Political issues in the origin	• Sudden political decisions in origin countries • Regulations in origin countries • Corruption (e.g., Tanzania) • Political instability • Inflation (e.g., Sri Lanka) • Governments unwilling to collaborate with international traders	• Delivery delays • Termination of projects / partnerships • Increased prices • Reduced product availability
Pests and diseases	• Plant diseases • Pests • Pollinator diseases • Farmer health issues	• Reduced product availability
Regulations	• Technical disruptions • Suppliers unable to provide required data • Regulations unimplementable in origin countries • Trade disruptions due to farmer group size limitations	• Greater concentration in supply chains, reduced spontaneous trade • Loss of some producers • Reduced product availability • Increased prices
Lack of Workers	• Worker shortages during harvest • Migration of young laborers • Migration of skilled professionals	• Risk to farm continuity • Reduced product availability
War / Armed Conflicts	• Armed conflict (e.g., Nigeria) • War (e.g., Russia and Ukraine) • Civil wars (e.g., Papua New Guinea, Ethiopia)	• Termination of projects/partnerships • Reduced commodity availability • Increased prices
Speculation	• Effects of commodities being traded on the stock exchange (e.g., coffee, cocoa)	• Increased prices • Non-compliance with contracts • Loss of some producers • Reduced product availability
Unusable quality of goods	• Pesticide residues • Certification failures • Delayed detection of excessively high analysis values due to foreign approval • Updrift	

Table 2: Top 10 disruption categories with examples and their impacts

Naturally, some disruptions have a greater impact than others. The effects of some disruptions are limited to a specific region or type of impact, while others have far-reaching consequences. This is especially true in today9s globalized world. For example, droughts are not only a significant issue in Brazil at the moment but have worldwide implications on pricing:

> *<Brazil is always particularly noticeable because it produces so much coffee ..., which is why it has the greatest impact on the price.= (ID 6)*

4.3.2 Reacting to Disruptions: Actions Taken by Companies

When the impact of these disruptions drives companies to take action, diversification is often the answer. A widely used approach in the agricultural commodity trade, and the most frequently mentioned in this analysis, is to source from an alternative origin. For instance, political issues of a specific origin may force the termination of partnerships, significantly reducing a company9s presence in that country. Similarly, in the case of climate-related crop issues, having a diverse network of suppliers proves advantageous. However, it9s important to note that the strategy of simply shifting to another region when problems arise may not remain viable indefinitely.

> *<So, if your company is very big and has a sourcing diversification strategy, it allows teams to react to disruptions in one area by sourcing from a different area, and the company somehow maintains stability. That has a limit. With time changing, we9ll get more and more disruptions in supply chains, it9s likely that we cannot use this strategy*

forever. And that9s one of the conversations: what are suppliers doing to improve resilience in specific areas to ensure there are no shocks to the supply chains and no disruptions? Yes, welcome to the future.= (ID 9)

Another significant measure observed in the interviews is switching the commodity being purchased. This can range from less drastic adjustments, such as altering the ratio of Arabica and Robusta or changing the quantity of the material in the final product, e.g., chocolate, to the more extreme step of exiting the product market entirely. Other smaller steps that were mentioned, include increasing transparency in supply chains, investing in research, staying up to date with the situation in the origin, improving communication with all stakeholders, and generally dedicating more effort to planning, including allowing for greater time buffers, among other measures.

4.3.3 Connection to Previous Literature

The analysis of disruptions in agricultural commodity supply chains provides a foundation for connecting these findings to established literature. In general, the disruptions mentioned by the interviewees stem from external rather than internal sources, a distinction supported by Ponomarov & Holcomb (2009). These disruptions experienced can be broadly categorized into gradual stresses - such as climate change, urbanization, including a lack of workers for harvest and the discontinuation of farms - and sudden shocks, such as terrorist attacks, hurricanes and political issues (Fiksel, 2015).

To connect these findings with the existing literature, I compare the identified disruptions with the vulnerability factors proposed by Pettit et al. (2013). For clarity, key concepts from Table 2 are bolded and italicized to facilitate comparison. Among these vulnerability factors for supply chains are deliberate threats such as ***terrorism and theft***, exemplified by ***vanilla-related issues in Madagascar***. External pressures, including ***environmental and regulatory changes***, are similarly highlighted. Price pressures, such as ***speculation*** on stock-listed commodities, are another type of external pressures. The vulnerability factor of resource limits, which includes ***raw material availability***, aligns with a frequently mentioned impact of disruptions noted by interviewees. ***Logistical challenges***, another recurring theme, correspond with the connectivity vulnerability factor, which encompasses subfactors like import and export channels.

Another factor mentioned is turbulence, defined as an environment subject to frequent, uncontrollable changes in external factors. This concept is in line with experiences shared in the interviews and includes ***geopolitical disruptions*** as a subfactor, reflecting challenges such as ***wars and armed conflicts***. Disruptions involving ***unusable quality of goods***, often

highlighted as a common issue, align with the vulnerability factor sensitivity, which emphasizes the need to maintain control over conditions to ensure both product and process integrity.

4.3.4 Perception of <Recovery= and its Impossibility

Recovery plays a central role in resilience discussions, yet the interviewees perceive recovery in agricultural supply chains in diverse ways, highlighting the limitations of traditional definitions of resilience in supply chains. Their insights reveal that recovery is not a straightforward process with a beginning and an end but rather an ongoing adaptation to a volatile and unpredictable environment. Through their perspectives, the chapter examines the evolving meaning of recovery. The concept of a swift recovery, as mentioned in the resilience in agri-food definition by Stone & Rahimifard (2018), contrasts with the experiences of many interviewees. One perspective emphasizes that it is no longer possible to rely on certain established patterns in raw material markets as was possible just a few years ago. A return to previous conditions is not expected, making the term <recovery= highly relative (ID 8). Some disruptions, such as those caused by natural disasters, show signs of recovery. For instance, infrastructure is rebuilt through reconstruction efforts and emergency aid. Similarly, adjustments are being made to mitigate the effects of climate change. However, regarding climate change, most interviewees expressed a clear stance:

> *<I don9t believe we will see recovery; this is just the beginning of what we are experiencing today.=* (ID 5)

Logistical disruptions, such as those caused by the ship-attacking Houthi militia, are expected to eventually stabilize. However, interviewees noted that this will not happen quickly, and no immediate resolution is anticipated. One participant emphasized,

> *<We9ve always experienced strikes and political problems in certain countries, but now it feels almost universal. There are hardly any shipping routes or ports that are trouble-free anymore.= (ID 2)*

Rather than speaking of recovery, interviewees often referred to a state of constant challenges. This perspective aligns with the broader sentiment that disruptions, particularly logistical and climatic, represent ongoing issues rather than temporary setbacks.

> *<Since 2019 and the onset of COVID-19, we as a company have been in crisis mode, and that hasn9t changed. We move from crisis to crisis, trying to find solutions.= (ID 14)*

This sentiment is reinforced by the increasing frequency and intensity of disruptions, such as droughts, frosts, and pest attacks. These events prolong recovery times and are often complicated by subsequent disruptions, creating a cycle of instability. Efforts to adapt include conducting studies to explore how businesses dependent on agricultural raw materials can secure their future in the face of climate change. In summary, recovery is not seen as a return to past conditions but rather as an ongoing process of adaptation, often disrupted by new challenges.

4.4 Effective and Ineffective Sustainability-related Practices Against Disruptions

When addressing disruptions, both effective and less effective practices can be adopted. However, according to the interviewees, certain disruptions lie beyond the scope of actionable interventions. To provide a clearer understanding of the disruptions and the practices associated with addressing them, Table 3 presents a structured summary. The disruptions are listed in the first column, followed by corresponding effective practices and ineffective practices. Additionally, the table includes general effective practices mentioned by interviewees that are not directly linked to specific disruptions, named <General=. Notably, most of the practices highlighted are aimed at addressing issues occurring in the origin regions. The following Table 3 provides a brief overview, with a detailed and comprehensive version available in 8.4 Appendix D.

Disruption	Effective Practices	Ineffective Practices
Climate	• Research on resilient crop varieties • Biodiversity: Diverse ecosystems • Farmer Training: Best practices, agroforestry systems, farm management • On-Site support: Field teams to assess site-specific needs and implement practical solutions	• Lack of adaptation to climate change • Absence of supplier engagement • Overreliance on training • Ignorance of additional factors
Diseases / Pests	• Networking: Strong collaboration among stakeholders • Direct relationships with farmers to know about issues • Breeding crop varieties that are more resilient to diseases • Research: Partnerships with universities and institutions	• Supplier Dependency: Relying on a single supplier for a commodity
Unusable quality of goods	• Training of Farmers: Supporting farmers through education on agricultural practices • Financial Incentives for Farmers: Providing financial support to encourage the production of good quality	
Lack of workers	• Financial incentives for farmers • Showing future perspectives: Networking and educational opportunities • Income diversification: Support of farmers in diversifying income sources • Next generation involvement	
Political issues in origin	• Collaborative Solutions: Working with partners, networks and development organizations to find effective solutions • Risk Management: Proactively avoid potential risks	• Promoting a shift in agricultural production without guaranteeing stable market access and support for farmers • Supplier Diversification to reduce dependency and increase flexibility
Regulation		• Relying on actions such as distribution of codes of conduct without meaningful engagement • One-Size-Fits-All assumption
Logistic	• Direct contact with stakeholders to foster stronger relationships and better knowledge of issues	
General	• Direct contact and communication • Supply Chain Simplification: Reducing intermediaries • Building robust relationships among stakeholders in origin regions • Effectiveness Monitoring: Evaluating the success of best practices or the performance of different crop varieties to ensure desired outcomes • Optimization through Transparency: Enhancing processes by having more information about the supply chain • Providing farmers with credits to enable access to technology	• Data Requirement: Not collecting data

Table 3: Examples of effective and ineffective practices

4.4.1 Limitations of Influence of Sustainability-Related Practices

According to the interviewees, some disruptions are beyond the influence of actions or interventions. Hence many practices are not expected to be effective. For instance, in cases of extreme political change in a country, projects and partnerships may sometimes need to be written off as losses. Similarly, significant investments in productivity-enhancing measures such as soil analysis to optimize fertilizer use can be unsuccessful if there is insufficient rainfall and no access to irrigation. Despite substantial investments, the desired outcomes may not be achieved, though these measures likely prevent an even worse harvest. Another critical factor is the company9s position within the supply chain, which determines the extent of its influence and insight into upstream supply chain dynamics.

4.4.2 Interview Findings on Effective and Ineffective Sustainability Practices

The interview findings highlight the nuanced factors influencing the effectiveness of sustainability-related practices, emphasizing that no universal approach can address all challenges. An additional insight from the interviews is that the success of these practices depends significantly on the farmer, the origin, and the specific commodity involved, underscoring the need for tailored solutions rather than a one-size-fits-all approach. The most effective practices are predominantly mentioned in relation to climate-related disruptions, with a strong emphasis on farmer training, research into resilient crop varieties, and the implementation of best practices, which are highly dependent on local conditions. A notable shift in this area is the growing reliance on local expertise, providing farmers with broader support beyond training and integrating local knowledge into research efforts. Climate-related effective practices often have cross-cutting benefits; for example, increased biodiversity not only improves the microclimate but also diversifies farmers9 income streams, enhancing their resilience by reducing dependence on a single crop.

Furthermore, direct contact with suppliers, partners, and other stakeholders in the origin was mentioned by nine respondents as an effective practice. This approach naturally intersects with the dissemination of best practices in agriculture. Direct contact during disruptions offers advantages for the companies interviewed, such as securing the first right of refusal, exerting greater influence on operations in the origin, and gaining earlier access to information about events that could impact those operations. It is identified as a sustainable practice, as it enables the establishment of direct contracts that specify the services or goods to be delivered and provide farmers with purchase guarantees, for example. In contrast, conventional trade is

described as: *<&it is what we call conventional trade, and it comes from other traders, but we don9t have traceability on who is selling the product.= (ID 9)*

In general, the practices discussed focus primarily on the actions of companies. However, one notable exception is the critique of ineffective practices related to regulations. While regulations were previously mentioned as a disruption as well as a sustainable category, their partial ineffectiveness was emphasized again. For example, it could be argued that issues such as child labor, which can disrupt supply chains, require regulatory action as a form of practice. However, relying on superficial actions, such as merely distributing codes of conduct or implementing whistleblowing systems without meaningful engagement, as well as assuming a one-size-fits-all approach, was deemed ineffective.

4.4.3 Linking Insights from Literature and Interview Findings

Similar to the previous analysis above, the findings indicate that there is a certain level of overlap with previous literature. For ease of comparison with the interview findings, they are highlighted once more. Particularly noteworthy are the ***climate-related*** practices that revolve around ***supplier cooperation, education, support***, and the application of environmental technologies, such as ***R&D capabilities***, which appear to align closely with the sustainable practices highlighted by Herrmann et al. (2021). Practices such as ***paying premiums to farmers*** are often closely linked to certification schemes like Fairtrade and aim ***to support their livelihood***. While ***digitalization***, ***monitoring,*** and ***transparency*** practices may not seem directly related to sustainability, they are inherently connected to fostering ***direct contact with suppliers***.

In terms of resilience, a characteristic of resilient organizations is the ability to build ***powerful relationships***, a practice frequently highlighted in the interviews. ***Research*** is integral to ***designing resilient assets and processes***, but in agricultural supply chains, the focus remains on managing disruptions rather than exploring new opportunities for growth, according to the data collected (Fiksel, 2015). Furthermore, enhancing ***control and collaboration***, increasing ***visibility***, and ***improving capabilities*** are also identified as resilient practices for managing disruptions (Pettit et al., 2013; Negri et al., 2021; Christopher & Peck, 2004; Rajesh, 2019). ***Managing and expanding knowledge***, along with developing ***social capital***, are practices highlighted by the interviewees and recognized as elements of resilience in the supply chain (Ali et al., 2017).

4.5 Trade-Off between Resilience and Sustainability

Although many sustainability practices appear to be effective in enhancing resilience in supply chains, there are important factors to be highlighted that suggest that this positive relation may be difficult to implement.

An example where coexistence may be challenging is the emergence of supplier-led programs driven by customer demand, with variations in the implementation of sustainability across commodities influenced by market interest and customers9 willingness to pay a premium. Industries such as beverages and pharmaceuticals exhibit less customer interest in sustainability initiatives. Market interest is also shaped by geography; regions like Asia, South America, and Africa often prioritize price over sustainability requirements. This dynamic highlights the dependency of sustainable development in the upstream supply chain on the willingness of the downstream supply chain to bear additional costs. As one interviewee summarized:

> *<I can develop the upstream supply chain to a certain standard if the downstream supply chain is willing to cover the additional costs.=* (ID 15)

The need for initiative from organizations becomes even more critical in addressing the topics they consider important, especially as disruptions in supply chains are often left to the respective actors to manage individually. This is particularly significant in the context of changing climatic conditions, where proactive action is crucial due to the increasingly strained availability of goods due to crop failures and related challenges.

With the strong emphasis on the importance of direct contact, good partnerships, and advantages like the first right of refusal, one significant point that does not automatically align with building sustainable supply chains is the implementation of resilient practices such as redundancies and flexibility (Pettit et al., 2013; Negri et al., 2021). A commonly mentioned response to disruptions is sourcing from another region. One interviewee stated that balancing direct and indirect sourcing is important for managing risks. He explained that the <60/40 split= allows 40% to be sourced through indirect trade, reducing risk and increasing raw material stocks to bridge harvest seasons. While the 60% direct partnerships are essential for responding to disruptions, expanding these connections requires significant resources and time to establish stable, long-term relationships (ID 11).

Pettit et al. (2013) developed a framework for evaluating and managing resilience in supply chains. It is based on two concepts, namely vulnerabilities and capabilities. The supply chain capabilities are defined as attributes that allow an organization to anticipate and recover from

disruptions. One capability factor is, as mentioned before, flexibility in sourcing, which refers to the ability to quickly adjust inputs or procurement methods, including utilizing adaptable supplier contracts or maintaining access to diverse sourcing options. However, this contrasts with the sustainable practice of establishing direct partnerships and committed purchase quantities. This industry-specific insight matches with the observations made by Fahimnia et al., (2019). Another capability factor is financial strength, with price margin as a subfactor. The higher costs associated with establishing and maintaining sustainable supply chains can be a trade-off in this context (Pettit et al., 2013).

5 General Discussion

In this thesis, I examined the relationship between resilience and sustainability in the upstream supply chains of companies working with agricultural raw materials, providing industry-specific insights as I sought to answer the question <Why do some sustainable practices in upstream agricultural commodity supply chains foster more effective recovery from disruptions, while others do not?=. As I do so, I specifically focused on sustainable practices implemented in the upstream supply chain, the disruptions that challenge their continuous functionality, the actions taken in response to these disruptions, and the interviewees9 perspectives on effective and ineffective practices for managing them. I used purposive sampling to select suitable interview candidates and conducted semi-structured interviews, which were analyzed using grounded theory, resulting in categorized findings summarized in comprehensive tables. Drawing on the data collected through the interviews, I linked practices to resilience and sustainability, offering actionable insights for both practitioners and researchers.

This thesis shows that certain sustainable practices enhance resilience while others present potential conflicts. Among the most mentioned sustainable practices for addressing climate-related disruptions are training of farmers, researching resilient crop varieties, and implementing best practices tailored to local conditions. A growing reliance on local expertise by invested supply chain stakeholders improves support for farmers and integrates local knowledge into research efforts. These practices often yield cross-cutting benefits, such as improved biodiversity, which enhances resilience and diversifies farmers9 income streams. Additionally, direct contact with suppliers and stakeholders in the origin was highlighted as effective for fostering sustainable practices, securing operational advantages, and ensuring the first right of refusal and a better anticipation of possible problems. In some cases, the most

suitable resilient practices might not align with sustainable ones; this is evident with flexibility in sourcing. This approach, often mentioned as a response to disruptions, involves changing the sourcing origin as a risk management strategy for companies, which contradicts the goal of establishing strong partnerships with stakeholders in the origin countries.

Furthermore, the findings reveal that, according to the interviewees, it is not always possible to address disruptions through practices or actions. Some disruptions, such as extreme political changes or insufficient rainfall, are beyond the control of actions or interventions, sometimes leading to the failure of projects or investments. Additionally, the effectiveness of practices depends on factors like the company9s position in the supply chain, as well as the specific farmer, origin, and commodity, highlighting the need for tailored, context-dependent solutions.

Finally, the concept of recovery from the literature, in the context of resilience in supply chains, needs to be redefined and adapted. Analysis of the interviews reveals that the often-mentioned idea of a swift recovery in supply chain resilience contradicts the perception of many interviewees, who expressed that some disruptions are more of a constant issue rather than something that can be quickly resolved and recovered from.

5.1 Theoretical Contribution

This thesis contributes to the theoretical literature by exploring the relationship between sustainable and resilient practices in agricultural supply chains, addressing a gap in the understanding of resilience in supply chains, and providing a framework for effective and ineffective practices in upstream agricultural supply chains.

Arimany-Serrat et al. (2024) emphasize the lack of consensus in the literature regarding the relationship between sustainability and resilience, particularly whether they function as independent, dependent, compatible, or conflicting constructs. Examining the capability factors outlined by Pettit et al. (2013) reveals that flexibility in sourcing - a factor for resilience in supply chains - stands in contrast to sustainable practices such as fostering direct contact and establishing long-term partnerships with stakeholders in the origin. This trade-off, which has a substantial impact, involves sourcing from alternative origins in response to disruptions - an action frequently mentioned by interviewees. Additionally, the implementation of sustainable practices often necessitates significant investments, which may, at times, conflict with the financial strength required for maintaining resilience in supply chains. Another point mentioned by the interviewees, however, suggests that financial independence, supported by targeted training programs, can enhance farmers9 resilience. Many of the other capabilities align closely

with sustainability, such as efficiency gained through training in best practices, visibility achieved through information exchange, and anticipation supported by forecasting abilities due to direct contact. The findings also indicate that some sustainable practices are independent of resilience capabilities, such as specific supplier-led projects focused on tiger refuges or purchasing coffee from displaced persons.

The data collected through the interviews indicate that the concept of recovery often emphasized in definitions of resilience and supply chains, including agricultural supply chains specifically (Ponomarov & Holcomb, 2009; Zhang et al., 2024; Stone & Rahimifard, 2018), is not as easily applicable in practice as these definitions suggest. It became evident that recovery is often not feasible for many of the disruptions experienced in the upstream supply chains of products such as coffee, cocoa, herbs, and spices, among others. In the context of agricultural products, the loss of a harvest season in a specific geographical area can have a significant impact on the market, as that portion of the harvest is permanently lost for the year. This represents a unique challenge for agricultural supply chains, setting them apart from disruptions caused by political issues in origin countries or logistical problems such as those involving Houthi rebels or container shortages.

Overall, the thesis provides a framework that can be adapted and expanded upon in future research regarding effective and ineffective practices for addressing disruptions in upstream agricultural supply chains and general conditions in origin countries.

5.2 Managerial Implications

With the increasing impact of disruptions on global supply chains and the necessity to implement sustainable practices, whether due to climate change, regulations, or customer demand, specific knowledge about how to enhance both resilience and sustainability simultaneously is becoming increasingly important.

As for practices that encompass both traits, resilience and sustainability, parts of the resilient capability to anticipate include knowledge management, which encompasses training, education, and supply chain understanding, as well as increasing visibility and situational awareness. These directly connect with sustainable practices that involve direct contact, such as partnerships and the training of farmers. The ability to respond to disruptions aligns with similar aspects: collaboration plays a crucial role and is reflected in partnerships with local institutions, for example. Additionally, after a disruption has occurred, education and training remain integral to resilient capabilities, alongside fostering innovation, for example, in the

development of agricultural best practices (Ali et al., 2017).

As previously mentioned, financial strength and flexibility in sourcing often conflict when balancing resilience and sustainability in certain situations. Flexibility in sourcing can be at odds with sustainable practices, such as fostering direct contact and establishing long-term partnerships. Companies can address this challenge by either building an especially broad network or dividing their sourcing between direct and indirect methods. Sourcing from alternative origins, a commonly mentioned strategy by interviewees for managing disruptions underscores this trade-off. Furthermore, sustainable practices often demand significant investments, which can strain the financial resources required for maintaining resilience. Regarding ineffective practices, it was emphasized that training farmers should not be overly relied upon. Assuming that producers lack knowledge and focus solely on training without addressing other necessary support measures can limit effectiveness. Ignoring additional critical factors beyond training, like having access to certain tools, which are essential for successful implementation, undermines the impact of such initiatives. Another change in practices that was observed among some stakeholders is that applying uniform solutions to all farmers without considering their individual needs or circumstances is no longer appropriate. It is essential to avoid patronizing farmers and instead prioritize respecting local cultural, geographical, and agricultural contexts. This aligns with the importance of trust in local expertise; for example, regional agricultural engineers are uniquely equipped to assess and address specific geographical challenges.

5.3 Limitations and Future Research

Several limitations need to be highlighted. The interviewees were not always experts on all topics; some focused more on disruptions due to their department or the node in the supply chain their company occupies, while others concentrated on sustainable practices and their impacts. Although the interviewees had a professional understanding of all relevant topics, a personal bias of the interviewees cannot be excluded, as their companies have often placed particular emphasis on supply chain traceability. The challenge with interviewing individuals from companies that do not prioritize visibility in their supply chains is that some interviews, such as with ID 7 in this case, might need to be excluded. This is because, in conventional buying practices, employees may have limited knowledge about the supply chain. However, since this is not always the case, future research could explore the differing perspectives of both types of companies in greater depth.

Furthermore, two factors appear to be homogeneous in the sampled data: Geographic focus was

mainly on Germany, and nine of the interviewees operated within coffee supply chains, either exclusively or alongside other commodities. This homogeneity limits the generalizability of the findings, as the insights may not fully represent companies from other countries or supply chains involving different commodities. Although some interviewees suggested that commodities, such as cocoa, coffee, or bananas, do not significantly influence the implementation of sustainable practices and the occurrence of disruptions, others expressed conflicting views on this matter. The same applies to specific geographical conditions, as interviewees highlighted those regional differences, extending beyond national boundaries, often influence the effectiveness and relevance of practices. These variations are shaped by multiple factors, making the field highly nuanced and context dependent.

It would be valuable to examine a sample across different company types, for example, traders and exporters, as well as to collect data from the origin. This approach could provide insights into the differences in viewpoints between different nodes in the supply chain and the perspectives of farmers on effective practices for mitigating disruptions. It would allow for drawing conclusions from firsthand insights from farmers, such as validating whether practices are actually implemented and effective in the origin, as well as examining regional differences. For further research, it would be essential to incorporate a larger and more diverse sample to generate more generalizable insights.

Another limitation of this work, which should be addressed in future research, is the lack of integration between qualitative insights and quantitative methods. While this study provides valuable insights into resilience and sustainability practices, incorporating quantitative metrics could enhance the rigor and generalizability of the findings. For instance, metrics could be used to evaluate the effectiveness of specific practices across different regions, offering a more concrete understanding of their impact.

Since I focused on the upstream supply chain, factors such as capacity, defined as the accessibility of resources to maintain consistent production levels, with subfactors including reserve capacity and backup energy sources, were not analyzed, and no statement or conclusions can be drawn about these aspects (Pettit et al., 2013). This represents a limitation that future research could address by examining the industry-specific relationships between resilience and sustainability in the internal and the downstream supply chains.

6 Conclusion

This thesis analyzed the complex relationship between sustainability and resilience in upstream agricultural supply chains through interviews with experts working with commodities such as coffee, cocoa, tea, and spices. The collected data reveals that while many sustainable practices enhance resilience, trade-offs between the two are also evident in practice. For instance, concepts such as maintaining direct contact and ensuring farmers9 livelihoods through guaranteed purchase quantities can conflict with resilience measures that prioritize sourcing flexibility for a safer supply of commodities.

The findings contribute to understanding the interactions between sustainability and resilience, particularly in agricultural supply chains that are especially vulnerable to various disruptions. Notably, the analysis of the conducted interviews provided new insights into the concept of recovery. It became evident that, in the agricultural context, recovery may not always be feasible in the same way it is considered in resilience definitions in the literature, necessitating a shift towards continuous adaptation and proactive resilience-building measures within these definitions.

Practical implications include the identification of effective practices matched to specific disruptions and general conditions in the origin countries, such as farmer training, local expertise integration, and next-generation involvement. At the same time, the research outlines practices deemed ineffective based on the experiences shared by the interviewees.

However, the study acknowledges limitations, including a geographically limited sample and a focus on specific commodities, which may affect the generalizability of the results. Future research should examine differences between regions, commodities, and perspectives in more depth, combining qualitative findings with quantitative metrics to improve understanding further.

In summary, this thesis conducts an explorative study based on a qualitative approach, highlighting the importance of pursuing both sustainability and resilience in supply chains while recognizing trade-offs. The findings provide valuable guidance for companies aiming to build supply chains that are not only more resilient to disruptions but also sustainable for the future of agricultural commodity supply. Overall, the research contributes to a more nuanced and actionable understanding of sustainable and resilient supply chain management in an industry-specific context.

7 References

Adams, W. C. (2015). Conducting Semi0Structured Interviews. In K. E. Newcomer, H. P. Hatry, & J. S. Wholey (Eds.), *Handbook of Practical Program Evaluation* (1st ed., pp. 4923 505). Wiley.

Ali, A., Mahfouz, A., & Arisha, A. (2017). Analysing supply chain resilience: Integrating the constructs in a concept mapping framework via a systematic literature review. *Supply Chain Management: An International Journal*, *22*(1), 16339.

Arimany-Serrat, N., Montanyà, O., & Amat, O. (2024). Sustainability as a Resilience Factor in the Agri-Food Supply Chain. *Sustainability*, *16*(16), 7162.

Bernabei, M., Colabianchi, S., & Costantino, F. (2022). Actions and Strategies for Coronavirus to Ensure Supply Chain Resilience: A Systemic Review. *Sustainability*, *14*(20), 13243.

Camur, M. C., Ravi, S. K., & Saleh, S. (2023). Enhancing Supply Chain Resilience: A Machine Learning Approach for Predicting Product Availability Dates Under Disruption. *Expert Systems with Applications*, *247*.

Christopher, M., & Peck, H. (2004). Building the Resilient Supply Chain. *The International Journal of Logistics Management*, *15*(2), 1314.

Cloutier, C., & Ravasi, D. (2021). Using tables to enhance trustworthiness in qualitative research. *Strategic Organization*, *19*(1), 1133133.

Corbin, J., & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons and Evaluative Criteria. *Zeitschrift Für Soziologie*, *19*(6), 4183427.

Cotta, D., Klink, L., Alten, T., & Al Madhoon, B. (2023). How do supply chain managers perceive the relationship between resilience and sustainability practices? An exploratory study. *Business Strategy and the Environment*, *32*(6), 373733751.

Edmondson, A., & McManus, S. (2007). Methodological Fit in Management Field Research. *Academy of Management Review*, *32*, 115531179.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, *50*(1), 25332.

Elkington, J. (1998). Accounting for the triple bottom line. *Measuring Business Excellence*, *2*(3), 18322.

Etikan, I. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American*

Journal of Theoretical and Applied Statistics, *5*(1), 134.

Fahimnia, B., Jabbarzadeh, A., & Sarkis, J. (2018). Greening versus resilience: A supply chain design perspective. *Transportation Research Part E: Logistics and Transportation Review*, *119*, 1293148.

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*, *162*, 1013114.

Fahimnia, B., Sarkis, J., & Talluri, S. (2019). Editorial Design and Management of Sustainable and Resilient Supply Chains. *IEEE Transactions on Engineering Management*, *66*(1), 237.

Fiksel, J. (2015). *Resilient by design: Creating businesses that adapt and flourish in a changing world.* Island Press.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. *Organizational Research Methods*, *16*(1), 15331.

Govindan, K., Shaw, M., & Majumdar, A. (2021). Social sustainability tensions in multi-tier supply chain: A systematic literature review towards conceptual framework development. *Journal of Cleaner Production*, *279*, 123075.

Gupta, H. (2024, August 16). *How Climate Disasters Are Making Food Expensive Everywhere*. TIME. https://time.com/7010929/climate-disaster-food-cost-essay/

Hallikas, J., Lintukangas, K., & Kähkönen, A.-K. (2020). The effects of sustainability practices on the performance of risk management and purchasing. *Journal of Cleaner Production*, *263*, 121579.

Hassini, E., Surti, C., & Searcy, C. (2012). A literature review and a case study of sustainable supply chains with a focus on metrics. *International Journal of Production Economics*, *140*(1), 69382.

Herrmann, F. F., Barbosa-Povoa, A. P., Butturi, M. A., Marinelli, S., & Sellitto, M. A. (2021). Green Supply Chain Management: Conceptual Framework and Models for Analysis. *Sustainability*, *13*(15), 8127.

Holger, D. (2023, January 24). Companies Rush to Trace Sprawling Supply Chains as Sustainability Rules Loom. *Wall Street Journal*. https://www.wsj.com/articles/companies-rush-to-trace-sprawling-supply-chains-as-sustainability-rules-loom-11674512050

Holling, H., & Backhaus, L. (2023). A Meta-Analysis of Green Supply Chain Management

Practices and Firm Performance. *Sustainability*, *15*(6), 4730.

Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *International Journal of Production Economics*, *232*, 107921.

Koberg, E., & Longoni, A. (2019). A systematic review of sustainable supply chain management in global supply chains. *Journal of Cleaner Production*, *207*, 108431098.

Magnani, G., & Gioia, D. (2023). Using the Gioia Methodology in international business and entrepreneurship research. *International Business Review*, *32*(2), 102097.

Munk, C. W. (2022, October 24). Companies Face Pressure to Improve Environmental Sustainability in Supply Chain. *Wall Street Journal*. https://www.wsj.com/articles/supply-chain-environmental-sustainability-interest-11666273681

Negri, M., Cagno, E., Colicchia, C., & Sarkis, J. (2021). Integrating sustainability and resilience in the supply chain: A systematic literature review and a research agenda. *Business Strategy and the Environment*, *30*(7), 285832886.

Ojo, L. D., Adeniyi, O., Ogundimu, O. E., & Alaba, O. O. (2022). Rethinking Green Supply Chain Management Practices Impact on Company Performance: A Close-Up Insight. *Sustainability*, *14*(20), 13197.

Pettit, T., Croxton, K., & Fiksel, J. (2013). Ensuring Supply Chain Resilience: Development and Implementation of an Assessment Tool. *Journal of Business Logistics*, *34*(1), 46376.

Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *The International Journal of Logistics Management*, *20*(1), 1243143.

Proença, J. F., Torres, A. C., Marta, B., Silva, D. S., Fuly, G., & Pinto, H. L. (2022). Sustainability in the Coffee Supply Chain and Purchasing Policies: A Case Study Research. *Sustainability*, *14*(1), 459.

Race, M., & Josephs, J. (2024, January 4). *Next warns of supply delays due to Red Sea shipping attacks*. https://www.bbc.com/news/business-67879640

Rajesh, R. (2019). A fuzzy approach to analyzing the level of resilience in manufacturing supply chains. *Sustainable Production and Consumption*, *18*, 2243236.

Rajesh, R. (2021). Optimal trade-offs in decision-making for sustainability and resilience in manufacturing supply chains. *Journal of Cleaner Production*, *313*, 127596.

Raman, R., Sreenivasan, A., Ma, S., Patwardhan, A., & Nedungadi, P. (2023). Green Supply Chain Management Research Trends and Linkages to UN Sustainable Development Goals. *Sustainability*, *15*(22), 15848.

Sánchez-Flores, R. B., Cruz-Sotelo, S. E., Ojeda-Benitez, S., & Ramírez-Barreto, M. E. (2020). Sustainable Supply Chain Management4A Literature Review on Emerging Economies. *Sustainability*, *12*(17), 6972.

Savage, S., Hancock, A., & Bounds, A. (2024, September 20). Coffee producers fear being cut off from EU by new land protection law. *Financial Times*. https://www.ft.com/content/2b398d0f-7e47-47e0-b0d0-85faa593a7f9

Scholten, K., & Schilder, S. (2015). The role of collaboration in supply chain resilience. *Supply Chain Management: An International Journal*, *20*(4), 4713484.

Solari, F., Lysova, N., Romagnoli, G., Montanari, R., & Bottani, E. (2024). Insights from 20 Years (200432023) of Supply Chain Disruption Research: Trends and Future Directions Based on a Bibliometric Analysis. *Sustainability*, *16*(17), 7530.

Speier, C., Whipple, J. M., Closs, D. J., & Voss, M. D. (2011). Global supply chain design considerations: Mitigating product safety and security risks. *Journal of Operations Management*, *29*(738), 7213736.

Stone, J., & Rahimifard, S. (2018). Resilience in agri-food supply chains: A critical analysis of the literature and synthesis of a novel framework. *Supply Chain Management: An International Journal*, *23*(3), 2073238.

Tarigan, Z. J. H., Siagian, H., & Jie, F. (2021). Impact of Internal Integration, Supply Chain Partnership, Supply Chain Agility, and Supply Chain Resilience on Sustainable Advantage. *Sustainability*, *13*(10), 5460.

Teuscher, P., Grüninger, B., & Ferdinand, N. (2006). Risk management in sustainable supply chain management (SSCM): Lessons learnt from the case of GMO0free soybeans. *Corporate Social Responsibility and Environmental Management*, *13*(1), 1310.

Tseng, M.-L., Islam, M. S., Karia, N., Fauzi, F. A., & Afrin, S. (2019). A literature review on green supply chain management: Trends and future challenges. *Resources, Conservation and Recycling*, *141*, 1453162.

World Economic Forum. (2024, August 7). *Here9s how we make the global food supply chain sustainable*. World Economic Forum. https://www.weforum.org/stories/2024/08/food-supply-

chain-networks-why-sustainable-practices-fail-and-approaches-to-improve-them/

Zhang, Q., Feng, Y., & You, L. (2024). Research on the Impact of Supply Chain Integration on Supply Chain Resilience in NEV Manufacturing Enterprises. *Sustainability*, *16*(19), 8546.

8 Appendix

8.1 Appendix A

Respondent ID	**Organization Type**	**Role / Position in Organization**	**Commodity**	**Duration**
1	Multinational Producing and Distribution Company	Head of Sustainability	Coffee, Tea, Cocoa	40 mins
2	Multinational Producing and Distribution Company	Raw Coffee Procurement	Coffee	70 mins
3	Leading Company in Natural Food and Beverage Ingredients and Solutions	Vice President of Geographical Commodity Area	Coffee	60 mins
4	Multinational Producing and Distribution Company	Downstream Trader	Tea	60 mins
5	Globally Active Raw Coffee Trader	Trader of Raw Coffee	Coffee	60 mins
6	Globally Active Raw Coffee Service Group	Head of Sustainable Business Unit Focused on	Coffee	60 mins

		Relationship with Suppliers / Producers		
7 - Excluded	Multinational Distribution Company	Procurement of Food Articles	e.g., Cocoa, sugar	50 min
8	Development Policy Organization for Ethical Trade	Head of Supply Chain Management	Cocoa, bananas, coffee, cotton, flowers, plants	55 min
9	Leading Company in Natural Food and Beverage Ingredients and Solutions	Regenerative Agriculture Program Manager	Spices, nuts, coffee, cocoa, dairy	60 min
10	Coffee Trading Company	Trader	Coffee	55 min
11	Spices and Herbes Trader	Head of CSR Management	Spices and herbes	60 min
12	Trader and Processor of Soft Commodities	Coffee Sustainability Department	Coffee	55 min
13	Food Retail Company with Focus on Traceability	Impact Analyst	Vegetable, fish, processed foods (e.g., chocolate)	40 min

14	Chocolate Producer	Sustainability Manager	Cocoa, sugar, hazelnuts etc.	40 min
15	Solutions for Plant-Based Raw Materials	Project Manager Global Sustainable Supply Chain Services	Herbes, fruits	55 min

8.2 Appendix B

Thank you for agreeing to participate in this interview. As part of my research for my master thesis, I am interested in gaining insights from experienced professionals like yourself. The purpose of this interview is to explore and understand the different sustainable strategies that organizations adopt in the upstream supply chain and how these strategies influence their ability to recover from various disruptions.
Disruptions may include natural disasters, sudden demand shocks, extreme weather conditions, and information and communication disruptions.

I prepared some questions for myself that are designed to guide our conversation and ensure we cover key topics, but please feel free to share any additional insights or examples that you believe are relevant.

Your responses will be kept confidential, and no identifiable information will be shared without your consent.
With your permission, I would like to record our conversation to facilitate a more detailed analysis.

If you have any questions or concerns about the interview or the research in general, please do not hesitate to contact me (s-mjungenfeld@ucp.pt).

Thank you again for your valuable time and participation.

Interview Questions

1 General

1.1 Can you briefly describe the company you work in?

2 Supply Chain

2.1 What commodity supply chain is your company working in?

2.2 What is the company9s role in the supply chain?
(e.g., Trader, Import/ Export, Producer of finished goods, retailer, expert)

2.3 Can you describe me the upstream supply chains you / your company are involved in?

2.4 In which aspects or dimensions do the supply chains differ from each other?

2.5 Which of these aspects would have the largest influence on the way you would enter a supply chain?

2.6 What geographies are the supply chains operating in? (if not already mentioned in 2.5)

I9m going to now switch the focus from the supply chains that you9re involved in, to sustainable supply chain management.

Sustainable supply chain management can be described as <aiming to maximize profitability and, at the same time, reduce the environmental impact and improve the social well-being of the various involved stakeholders=.

3 Sustainable Supply Chain Management:

3.1 What sustainable practices do you have experienced in your company9s upstream supply chain 5 years ago, and how have they changed in this time frame?

3.2 What sustainable practices do you have experience with?

Expert: What development have you seen in sustainable practices in the last 5 years?

3.3 Are the sustainable practices you told me about more likely to be implemented in certain upstream supply chains compared to others?

3.4 Which of these practices are only partially or fully implemented?

Expert: Are there differences between commodities in terms of upstream sustainable practices?

Now I would like to talk about disruptions you experienced in your supply chain.

4 Disruptions

4.1 What do you consider to be a disruption in upstream supply chains?

4.2 Can you describe the disruptions that affected your supply chain over the past 5 years?

Expert: What types of disruptions have you observed in supply chains over the last 5 years?

4.3 Are there any supply chains that are more exposed or at risk of disruptions than others?

4.4 What were the consequences of these disruptions on your / the supply chain?

4.4.1 What metrics do you track or follow to assess the consequences that qualifies events as disruptive?

Expert: What were the consequences of these disruptions in supply chains?

4.5 Given such consequences, how would you define recovery?

4.5.1 What is a successful recovery: Is it just going back to normal or is it making up for the loss in the meantime?

4.5.2 When would you consider operations, or the supply chain has gone back to normal?

4.6 How long does it typically take for the company to recover from a disruption x, y, z?

Expert: What has been your experience regarding recovery times?

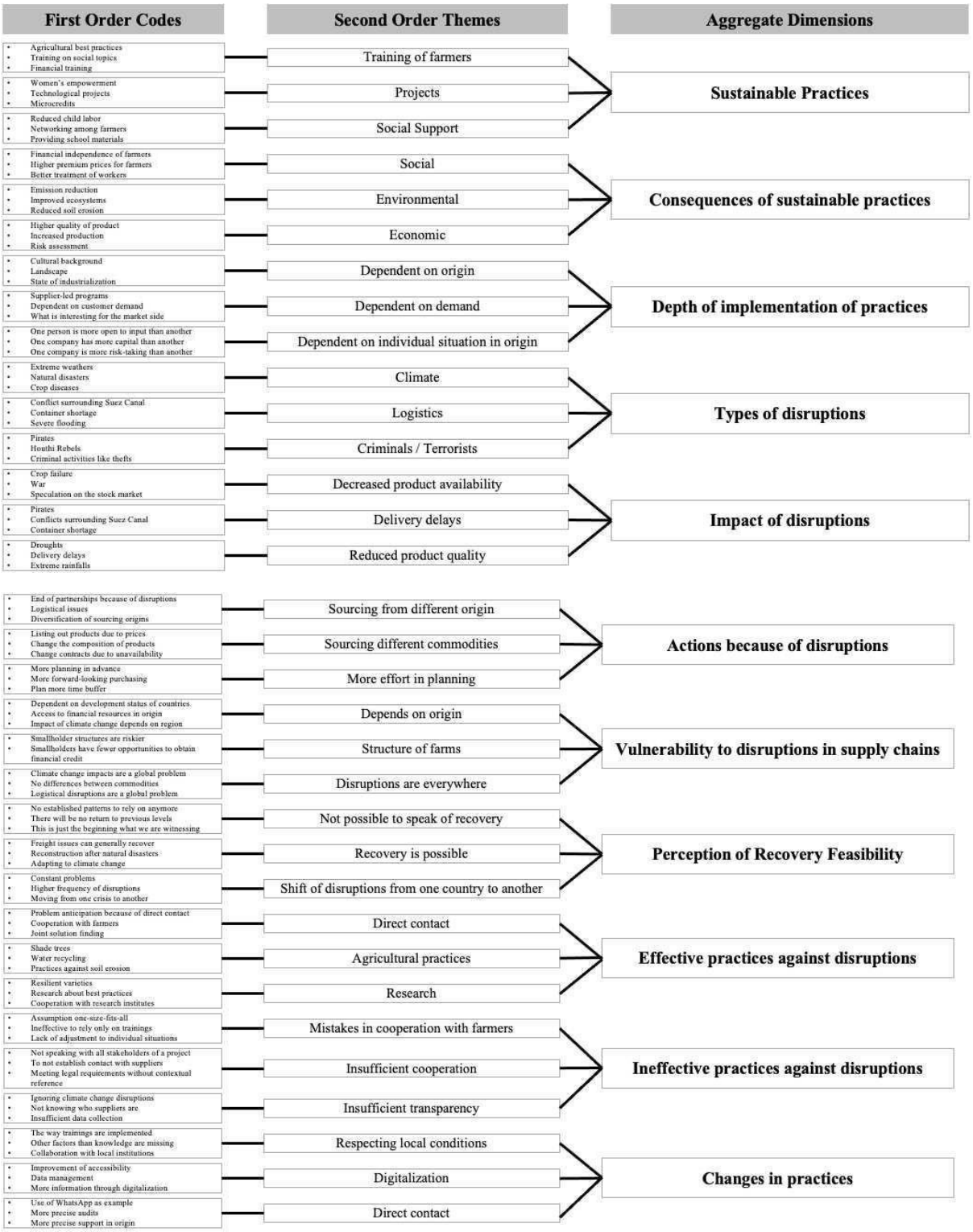
4.7 How does your company respond to such disruptions?

Expert: What actions did you observe from the industry in response to specific disruptions?

4.8 Were there any upstream related practices that stood out as particularly effective or ineffective during the recovery phase?

4.8.1 What changes, if any, were made to these practices based on those experiences?

8.3 Appendix C



8.4 Appendix D

Disruption	Effective Practices	Ineffective Practices	Notes / Context
Climate	**Variety Research**: Development of resilient crop varieties better adapted to climate change **Biodiversity**: Diverse ecosystems **Farmer Training**: Practices such as agroforestry systems, shade trees, water recycling, soil quality improvement, farm management, biodiversity preservation, and best practices tailored to local conditions **On-Site Support**: Field teams to assess site-specific needs and implement practical solutions **Research**: Tailored to regional needs to enhance resilience, partnering with universities and leveraging local expertise **Farmer-Centered Support**: Specific needs beyond training, such as access to financing and resources for purchasing essentials, adapted to local contexts **Internal Expertise**: Enhancement of organizational knowledge to better respond to climate-related challenges and implement adaptive best practices **Technology**: Usage that enables farmers to make optimal agricultural decisions based on their specific capabilities and circumstances **Knowledge Transfer**: Strengthening local networks to share insights and foster collaboration **Decentralized Implementation**: Development of projects with localized execution to ensure relevance and efficiency **Partnerships**: Collaboration with local institutions and universities to create sustainable, context-sensitive solutions **Farmer Resilience:** Diversification of farmers' income streams and integrate advanced technology to enhance their adaptive capacity	**Lack of Adaptation to Climate Change:** Failure to implement adjustments to address climate-related challenges **Overreliance on Training:** Assumption that producers lack knowledge and relying solely on training without considering other necessary support measures **Ignorance of Additional Factors:** Negligence to address critical factors beyond training that are essential for effective implementation **Absence of Supplier Engagement:** Not establishing direct contact with suppliers, which limits collaboration and understanding of on-ground realities	**Respect for Regional Conditions:** Important to avoid patronizing farmers and prioritize respecting local cultural, geographical, and agricultural contexts **Trust in Local Expertise:** Regional agricultural engineers can better assess and address specific geographical challenges **Example for Additional Factors:** Ensuring that farmers have access to necessary items, such as recommended tools and other items, to implement recommended practices effectively **Decentralized Project Implementation:** Respect of cultural, geographical, and language differences, more context-sensitive solutions are more effective **Partnerships with Local Institutions:** Collaboration with local universities and organizations to create pragmatic, locally validated solutions instead of imposing external requirements, ensuring supply chain practices align with regional needs **Better Farm Management:** Improved farm management practices that also provide financial benefits for farmers **Farmer Resilience:** Reduction of reliance on a single crop by encouraging crop diversification and integrating technologies like irrigation systems to enhance adaptability and productivity
Diseases / Pests	**Networking:** Strong collaboration among stakeholders in origin regions to enhance communication and coordination **Direct Contact:** Direct relationships with farmers to know about issues **Research:** Partnerships with universities and institutions **Resilient Varieties:** Breeding crop varieties that are more resistant to diseases and pests **Improvement of Internal Expertise:** Enhancement of organizational knowledge and skills	**Supplier Dependency:** Relying on a single supplier for a commodity increases vulnerability to disruptions	**Medium-Term Solutions:** Cultivation of new plant varieties offers a way to address challenges such as pest resistance, but requires time for development and growth **Ongoing Investment:** Continuous investment in the development of resilient crop varieties is important, as pest resistance and similar challenges demand ongoing approaches rather than single solutions
Diseases / Pests	**Networking:** Strong collaboration among stakeholders in origin regions to enhance communication and coordination **Direct Contact:** Direct relationships with farmers to know about issues **Research:** Partnerships with universities and institutions **Resilient Varieties:** Breeding crop varieties that are more resistant to diseases and pests **Improvement of Internal Expertise:** Enhancement of organizational knowledge and skills	**Supplier Dependency:** Relying on a single supplier for a commodity increases vulnerability to disruptions	**Medium-Term Solutions:** Cultivation of new plant varieties offers a way to address challenges such as pest resistance, but requires time for development and growth **Ongoing Investment:** Continuous investment in the development of resilient crop varieties is important, as pest resistance and similar challenges demand ongoing approaches rather than single solutions

Lack of workers	**Financial Incentives for Farmers** **Future Perspectives:** Networking and educational opportunities to enhance agricultural efficiency and economic viability **Income Diversification:** Support of farmers in diversifying income sources **Infrastructure Support:** Development of critical infrastructure **Next-Generation Involvement:** Involvement of younger generations in agriculture **Fair Treatment of Pickers:** Ethical and respectful treatment of agricultural workers		**Reducing Migration:** Future perspectives to encourage farmers to stay in agriculture **Making Farming Attractive:** Demonstration that farming has a viable future, offers profitability, and can mitigate risks

Political issues in origin	**Collaborative Solutions:** Working with partners, networks and development organizations to find effective solutions **Risk Management:** Proactively avoid potential risks	**Unstable Agricultural Shifts:** Promoting a shift in agricultural production without guaranteeing stable market access and support for farmers **No Supplier Diversification:** Not engaging more than one supplier for a commodity to reduce dependency and increase flexibility	

Regulation		**Superficial Measures:** Relying on actions such as distribution of codes of conduct or whistleblowing systems without meaningful engagement **One-Size-Fits-All Assumption:** Applying uniform solutions without considering specific needs or contexts	

Logistic	**Direct contact:** Establishing and maintaining direct communication with stakeholders to foster stronger relationships and better knowledge of issues		**Targeted Problem-Solving:** Identifying specific issues and providing loans to address them effectively

General	**Segmented Support:** Group farmers based on their knowledge level and tailoring measures to meet their specific needs	**Lack of Differentiation:** Applying uniform solutions to all farmers without considering their individual needs or circumstances	**Outdated Practice:** Not differentiating farmers and applying uniform solutions is considered an outdated approach
General	**Key Competitive Advantage:** Direct contact and presence in origin		**Proactive Problem Management:** Being present in origin allows for earlier anticipation of issues and timely adaptation of measures
General		**Limited Communication:** Failing to engage with all stakeholders involved in a project, which can hinder collaboration and effective implementation	**Customer Partnership Projects**: Projects conducted in collaboration with customers may face limitations, such as customers being unable to utilize the coffee produced from these initiatives.
General	**Targeted Investment**: Focused investment in specific topics with success measured through key performance indicators		**Superficial Outcomes**: It's not effective to end up with superficial results like "just a report with a few smiling faces."
General	**Direct Contact and Communication:** Establishing clear and consistent communication channels with stakeholders **Supply Chain Simplification:** Reducing intermediaries **Strong Local Networking:** Building robust relationships among stakeholders in origin regions		**Proactive Information:** Being informed about potential disruptions in an origin ahead of time **First Right of Refusal:** due to direct contact **Enhanced Contactability:** Facilitating faster responses to specific issues and prompt resolution of questions **Mitigating Risk Factors:** Leveraging strong relationships with local partners to address risks, such as managing the collapse of financial institutions through financially stable partners who can sustain supply chain operations **Streamlined Business Model:** Reducing intermediaries to maximize influence, ensuring early detection of disruptions, and enabling timely interventions and countermeasures **Preferred Customer Status:** Building close partnerships to secure priority treatment

General	**Effectiveness Monitoring**: Evaluating the success of best practices or the performance of different crop varieties to ensure desired outcomes	**Data Requirement:** Not collecting data	**Guidance for Farmers:** Providing farmers with clear information on actions to take to enable cycles of continuous improvement **Decision Documentation:** Keeping records of decisions made to track progress and inform future strategies
General	**Optimization through Transparency:** Enhancing processes by having more information about the supply chain **Information via Digitalization:** Leveraging digital tools **Simplified Data Management:** Reducing data density to maintain clarity and ensure it remains manageable		
General	**Premium Payments:** Supporting farmers by offering better prices through premium payments **Credit Access:** Providing farmers with credits to enable access to technology		
General	**Risk Monitoring:** Tracking risks to understand their origins and underlying causes		**Knowledge Building through Partnerships:** Leveraging partnerships to gain insights and expertise **Being aware of problem areas:** Addressing problems by targeting key areas, such as climate and social issues