

Review Article

The Adoption of Sustainable Supply Chain Management Practices on Performance of Agricultural Sectors in Ethiopia

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Abstract

In recent years, there has been a substantial increase in interest from both academic and corporate sectors concerning sustainable supply chain management. The increasing number of published papers focusing on this topic is a signal for this. To contribute further to the development of this field, this paper presents a comprehensive review of the existing literature on the impact of adopting sustainable supply chain management in the agricultural sector in Ethiopia, considering a total of 67 papers published between 2010 and 2023. This literature review aims to examine barriers, internal and external driving forces of the adoption of sustainable supply chain management practices, the impact of adopting sustainable supply chain management practices on the performance and identify constraints and opportunities of sustainable supply chain management practices in Ethiopian agricultural sectors. Focusing on the Ethiopian context, the study provides insights into the link between sustainable supply chain practices and performance outcomes. Additionally, NVIVO, qualitative data analysis software, was utilized to enhance the review process and ensure the systematic literature analysis.

Keywords

Agriculture Sector, Sustainable Supply Chain Management, Agricultural Economic, Social and Environmental Performance

1. Introduction

Agriculture is the backbone of the Ethiopian economy, and it contributes about 50% of the country's gross domestic product (GDP) and more than 80% of its exports [61] furthermore, it is one of the main employment sectors with about 80% of the country's population depending on the agricultural sector for their livelihoods [49]. The agricultural sector of Ethiopia is dominated by smallholder farming [7] Small-

holder farms are defined as being smaller than 2 ha and are mainly managed with family labor [52]. However, there are fewer Sustainable Supply Chain Management Practices that negatively affect the performance of agricultural sectors in Ethiopia. According to the Food and Agricultural Organization [19], sustainable agriculture can be defined by five key characteristics. These include the preservation and efficient

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use of resources, the avoidance of environmental degradation, the adoption of appropriate techniques, and the consideration of economic and social factors [20]. The adoption of sustainable supply chain management practices has gained significant attention in recent years due to increasing concerns over environmental sustainability and social responsibility. In the agricultural sector, where resource utilization and societal impacts are particularly pronounced, understanding the effects of sustainable practices on performance is of vital importance. Sustainability-related issues in supply chains have increasingly gained traction in supply chain literature for decades [17, 27]. Among these firms are food manufacturing supply chains that have been heavily criticized due to their negative contribution to the environment and society [23].

There is a growing understanding that companies need to prioritize sustainability within their supply chains as a crucial component of their overall business strategies [55]. Companies today are increasingly embracing sustainability practices due to the influence of different stakeholders such as government regulators, community activists, non-governmental organizations (NGOs), and global competition. These pressures have led to a greater commitment towards sustainability in many organizations. In the context of the supply chain, it is crucial to adopt management practices that not only enhance the company and overall supply chain performance but also consider social, economic, and environmental issues [9, 3]. This literature review aims to consolidate existing knowledge on the relationship between sustainable supply chain management practices and performance outcomes in the Ethiopian agricultural sector. Implementation of (SSCI) has been considered significant attention for the agricultural production and distribution system for the achievement of the key objectives of minimizing wastage and improving the perishable nature of products [42, 47, 57]. Ethiopia as an agricultural country focuses on strengthening the entire structure of Integrated Agro-processing firms and developing policies for socio-economic and eco-friendly aspects.

According to [30] air pollution, social constraints, and economic crises are affecting the available resources for the agricultural sectors to operate in an uncertain supply chain environment.

The demand for sustainability in supply chains is increasing to minimize environmental impacts and address the economic and social needs of the supply chain. Previous efforts have been made to analyze supply chains, but there is currently no framework available for effectively implementing sustainable practices in supply chains in Agricultural sectors. Many Agricultural sectors have started adopting various practices towards sustainable development, which they define as the production of goods and services using non-polluting processes and systems that conserve energy and natural resources. These practices should also be economically viable, safe, and healthy for employees, communities, and consumers, while also being socially and creatively rewarding for all working individuals.

Economical: By guaranteeing the business operates profitably while avoiding negative social and environmental effects, sustainable supply chains play a crucial role, and assessing how the optimal use of the available resources is responsible and efficient which may eventually provide long-term benefits will be evaluated.

Environmental: Agricultural Business managers need approaches to develop sustainable supply chain links with local producers that can integrate supply chain collaboration, competitive priorities, and social and environmental dimensions. According to [56] to stay competitive in a fast-paced and ever-changing business landscape, organizations that depend on their supply chains must enhance their agility in identifying and pursuing opportunities, improve their responsiveness to unexpected disruptions, and bolster their resilience against external threats.

Social: Businesses aim to implement competitive strategies that not only drive economic prosperity but also contribute to society and protect the environment by adhering to sustainable standards [4].

1.1. The Problem with Statement

Nowadays the use of input in agricultural sectors such as agro-chemicals (pesticides and herbicides) and chemical fertilizers are increasing. Regardless of that, the Ethiopian government promotes the use of those chemicals in an endeavor to increase yield and improve farmers' livelihoods. On the other hand, environmental researchers argue there are opportunities to harvest an equal level of yield by using sustainable agricultural practices and producing safe food. Supply chain managers are facing different challenges to practice sustainability in their daily functions due to global pressures about implementing SSCM [44]. At present, sustainability is no longer considered a choice but a necessity that must be considered for any activity and business [37]. Supply chains are now more vulnerable to various forms of disturbances and disasters, which occur unexpectedly and more frequently, causing significant consequences [62]. Firms that encountered disruptions in supply management, on average, witnessed a decline of 27% in their operating income, a decrease of 13% in their return on sales, and a drop of 16% in their return on assets [8]. According to [46] due to the fast growth of the industry in developing countries, pollution levels are increasing in these countries and implementation of sustainability in supply chains has become essential.

1.2. The Objective of the Research

1. To identify barriers, internal and external driving forces of adoption of sustainable supply chain management practices in Ethiopian agricultural sectors.
2. To evaluate the impact of adopting sustainable supply chain management practices on the performance of the agricultural sectors, including aspects of economic, en-

environmental sustainability, and social welfare.

3. To identify constraints and opportunities of sustainable supply chain management practices in Ethiopian agricultural sectors.

2. Literature Review

2.1. Adoption of Sustainable Supply Chain Management Practices in the Ethiopian Agricultural Sectors

2.1.1. Barriers to Adoption

Suppliers are in diverse geographical locations, causing a lack of transparency, especially while lower tiers are involved [40]. Several studies highlight the barriers that hinder the adoption of SSCM practices in Ethiopia's agricultural sectors. These barriers include a lack of awareness and understanding, limited financial resources, inadequate infrastructure and limited technical capabilities [43].

2.1.2. Drivers of Adoption

The studies also identify the factors that motivate agricultural firms in Ethiopia to adopt SSCM practices. These drivers include regulatory requirements, consumer demand for sustainable products, reduced costs and resource efficiency, improved brand reputation, and access to export markets. According to research conducted in China by [67], it was observed that the government has been implementing various strategies for environmental management.

(i). Internal Driving Forces

Multiple literature reviews have demonstrated that several internal factors encourage companies to embrace sustainable supply chain management (SSCM) practices, among them, the most prevalent and commonly recognized are.

A) Top Management Support and Commitment

According to Niemann et al. [48] top management commitment and support are critical in driving and enabling firms to successfully implement SSCM practices. McMurray et al. [45] stated that the implementation of green procurement is related to the influence of organizational leadership, policy, organizational strategy, and finance which needs top management commitment and support.

B) Company's Sustainable Supply Chain Management Strategy

The establishment of SSCM strategy by companies can influence firms towards the implementation of SSCM. C) Social responsibility.

C) Social Responsibility

According to [11] social and environmental responsibility is one of the driving forces that influence firms to evaluate and the responsibility for their operational negative impact on the social and environmental aspects of sustainability. Further-

more, as per [2, 6] corporations interested in enhancing their image, frequently make public their activities regarding environmental protection to give a picture of their commitment and concern for their stakeholders and the public at large.

D) Desire to Cut Down/Reduce Cost

The aspiration to cut down costs by firms is one of the driving forces for green/environmentally sustainable supply chain projects.

E) Risk Management

The results of a meta-analysis on green supply chain management practices and company performance, analyzing two decades of research from 1990 to 2011, showed a clear and beneficial association between environmental supply chain practices and firm performance [26].

(ii). External Driving Forces

After an extensive literature review, the most dominant and widely stated external driving forces are presented below.

a) Government Legislations

Government laws establish the guidelines for operations, and companies are required to adhere to global, national, and local laws while meeting customer needs. [41].

b) Pressures from Suppliers

Different scholars stated their views as suppliers play key roles in the implementation of sustainability. For instance, the suppliers, through providing valuable ideas can help firms in the implementation of green projects but they do not directly drive firms towards sustainability.

c) Pressures from Customers

Customers were discussed about how the expectations and requests from consumers for eco-friendly product development and production have a significant impact on companies in terms of Sustainable Supply Chain Management (SSCM) [24].

d) Pressures from Competitors

In present-day conversations, it has been suggested that companies may adopt green purchasing policies not only to contribute to saving the environment, but also to gain a competitive edge and improve their financial results [25].

e) Resource Depletion

There is a battle between supply chains for natural resources; it is indispensable to launch proactive measures to safeguard these resources for the coming generations.

f) Environmental Standards/ISO Certification

The companies' efforts to invest more in environmental management practices are significantly associated with ISO 14001 certifications.

g) Other Stakeholders (NGO and Community) Pressures

As was discussed by [24], one of the main external driving forces is the public movement towards higher environmental responsibility which increases pressures on firms in the adoption of SSCM practices. According to [5] when firms do not consider green procurement practices, it may result in public/community resistance and negatively affects organizational reputation.

2.2. Impact of Sustainable Supply Chain Management Practices on Performance

2.2.1. Economic Performance

SSCM practices also have a significant positive impact on the environmental performance of Ethiopian agricultural sectors. By promoting sustainable farming techniques, waste reduction, and resource conservation, these practices help mitigate environmental risks and enhance sustainability. The Climate Resilient Green Economy (CRGE) strategy is targeted to achieve green or low emissions economic growth that is resilient in the context of the adverse effects of climate change [28]. According to [58] in its broad spectrum, every dimension of business needs careful analysis for the effective implementation of the circular economy that has an impact on environmental performance.

2.2.2. Environmental Performance

SSCM practices also have a significant positive impact on the environmental performance of Ethiopian agricultural sectors. [2] By promoting sustainable farming techniques, waste reduction, and resource conservation, these practices help mitigate environmental risks and enhance sustainability. The Climate Resilient Green Economy (CRGE) strategy is targeted to achieve green or low emissions economic growth that is resilient in the context of the adverse effects of climate change [28]. According to [58] in its broad spectrum, every dimension of business needs careful analysis for the effective implementation of the circular economy that has an impact on environmental performance.

2.2.3. Social Performance

Adopting SSCM practices can lead to improved social performance in the agricultural sectors of Ethiopia. This includes enhanced working conditions, increased employment opportunities, improved community relations, and overall social well-being.

The social dimension of sustainability has been poorly investigated when compared to the environmental and economic dimensions, especially in sustainable supply chain management. Therefore, social factors are taken as the significant components of any organization as the success of any organization based on the constructs of corporate social responsibility measurement [38]. Due to the awareness of the social responsibility concept, it is required to moderate the supply chain management operations which affect the occupational human health and work safety by considering welfare and development of the community, lack of human food as the highest impact of climate change [10].

2.3. Constraints and Opportunities of Sustainable Supply Chain Management Practices in Ethiopian Agricultural Sectors

2.3.1. Implementation Challenges

The successful implementation of SSCM practices is crucial for realizing their potential benefits. However, studies have found various challenges in implementing these practices in Ethiopian agricultural sectors.

2.3.2. Sustainable Supply Chain Management Practices

Even though some authors classify SSCM practices into two broad categories i.e., sustainable purchasing practices, and sustainable manufacturing and logistics practices, as stated by different scholars in many works of literature reviewed under this study the main SSCM practices were classified into four sub-groups based on their function throughout the supply chain.

(i). Sustainable/Green Purchasing Practices

One of the key aspects of the green and sustainable supply chain is the use of green procurement practices. The sustainable supply chain is affected by the purchase practices of raw materials that are either reusable or recycled [53].

(ii). Sustainable Product and Process Design

According to [12] integrating life cycle assessment (LCA) principles in the supply chain/process, the design phase maximizes long-term sustainability.

(iii). Sustainable Packaging

Nowadays in society, there is a shortage of resources, and the accessibility of resources for use has turned out progressively rare. Nevertheless, most of the packaging items are single-use, and swing to squander after use and the item life cycle is short which leads to extensive usage of resources for packaging which threatens the natural condition through extraordinary danger.

(iv). Sustainable Logistics

In supply chain transportation has many potential negative impacts on the environmental, economic, and social aspects of SSCM. These impacts can be presented in monetary values by estimating and calculating all direct, indirect, and avoidance costs [13].

(v). Sustainable Supply Chain Management

Growing environmental and social problems have raised the awareness of sustainability among industries as well as regulatory bodies [29]. Governmental pressures could trigger the implementation of environmental management across

business [64]. According to [54], sustainability has been attracting attention from both academia and industry. The concept of sustainability in a SC is considered a key business issue, affecting the organizational performance concerning environmental risk, social risk, and financial risk [42]. Its goal is to enhance the long-term performance of individual companies and the entire supply chain as a cohesive unit [51]. Supply Chain Management (SCM): SCM requires traditionally separate material functions to report to an executive who is responsible for coordinating the entire materials process. It also requires joint relationships with suppliers across multiple tiers [60].

2.4. Stakeholder Theory

As per the stakeholder theory, organizations need to consider the interests of various stakeholders while undertaking their operations. When businesses faced challenges in creating value and fulfilling ethical responsibilities, Edward Freeman, a leading advocate of this theory, proposed the implementation of this approach [65]. This theory concentrates on how effectively leaders within a business adopt specific techniques to improve their relationship with stakeholders [21]. The link between a business and the individuals who are impacted by its operations and the development of ethical principles, according to [50] is at the heart of the stakeholder theory.

2.5. Conceptual Framework

The conceptual framework for this study is illustrated in Figure 1 as it explains the relationship between the study situations.

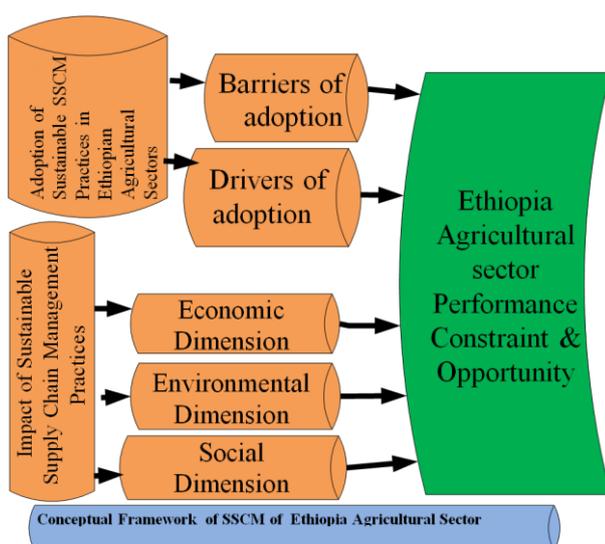


Figure 1. Conceptual Framework.

3. Research Methodology

This research first analyses the published literature utilizing a systematic literature review (SSCM) adapted from [22]. In conducting this literature review, NVIVO software was employed to efficiently manage and analyze the vast amount of available literature. NVIVO aids in organizing and categorizing relevant data, enabling a systematic and reproducible analysis. Through NVIVO's features, relevant themes, patterns, and relationships within the literature were identified.

Methods of Data Analysis

We can define a literature review as a structured, vibrant, and replicable approach to classify, evaluate, and interpret the collection of present written resources. The drive of analyzing these documents is to uncover information that does not require the researcher to gather new data. Literature reviews typically provide a summary of existing research by identifying common patterns, themes, and issues. Analyzing the adoption of sustainable supply chain management practices on the performance of agricultural sectors in Ethiopia using NVIVO a commonly used approach in this literature review is qualitative data analysis NVIVO is known for its ability to handle qualitative data analysis effectively. Descriptive analysis was also employed to identify the type of published materials used and data such as textual documents imported from literature into NVIVO and Utilize features like coding, categorization, and theme identification to analyze patterns, themes, and relationships within the data.

4. The Outcomes of the Research

Some potential outcomes and benefits of adopting sustainable supply chain management practices in the agricultural sector in Ethiopia:

A. Improved Environmental Sustainability: Negative environmental impacts were decreased by implementing sustainable supply chain management practices.

B. Enhanced Social Responsibility: local communities, farmers, and workers were addressed by Sustainable supply chain management practices.

C. Increased Efficiency and Productivity: Sustainability practices can increase the productivity of agricultural supply chains by dropping waste, enhancing resource allocation, and streamlining processes.

D. Access to New Market Opportunities: By implementing sustainable supply chain management practices, agricultural sectors in Ethiopia can gain a competitive advantage in the global market, attract environmentally conscious consumers, and access new market opportunities.

E. Strengthened Resilience to Risks: By implementing adaptive strategies and diversifying supply chains, agricultural sectors can better adapt to uncertainties and maintain their performance under changing circumstances.

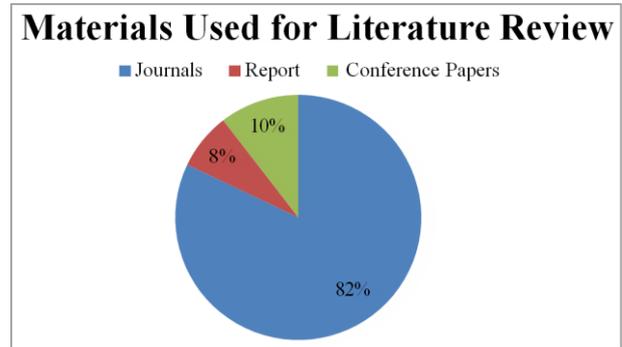
5. Results and Discussion

The combination of various studies reveals that the adoption of sustainable supply chain management practices positively affects the performance of agricultural sectors in Ethiopia. These practices, including sustainable sourcing, waste reduction, and renewable energy usage, lead to improved financial performance, environmental sustainability, and social development. Furthermore, the primary goal was to investigate how Ethiopian agricultural sector performance is impacted by sustainable supply chain management. A literature review findings showed that incorporating sustainability initiatives into an organization not only enhances its performance in terms of the economy, society, and environment but also increases its capacity for innovation and helps it gain a competitive edge over rivals. These results support previous research conducted by [15, 16], that the impacts of climate change are greater in agricultural-based economies.

5.1. Descriptive Analysis

This review of the literature included the review of 55 journals, 7 conference articles published, and 5 reports published precisely to address the topic of sustainable supply

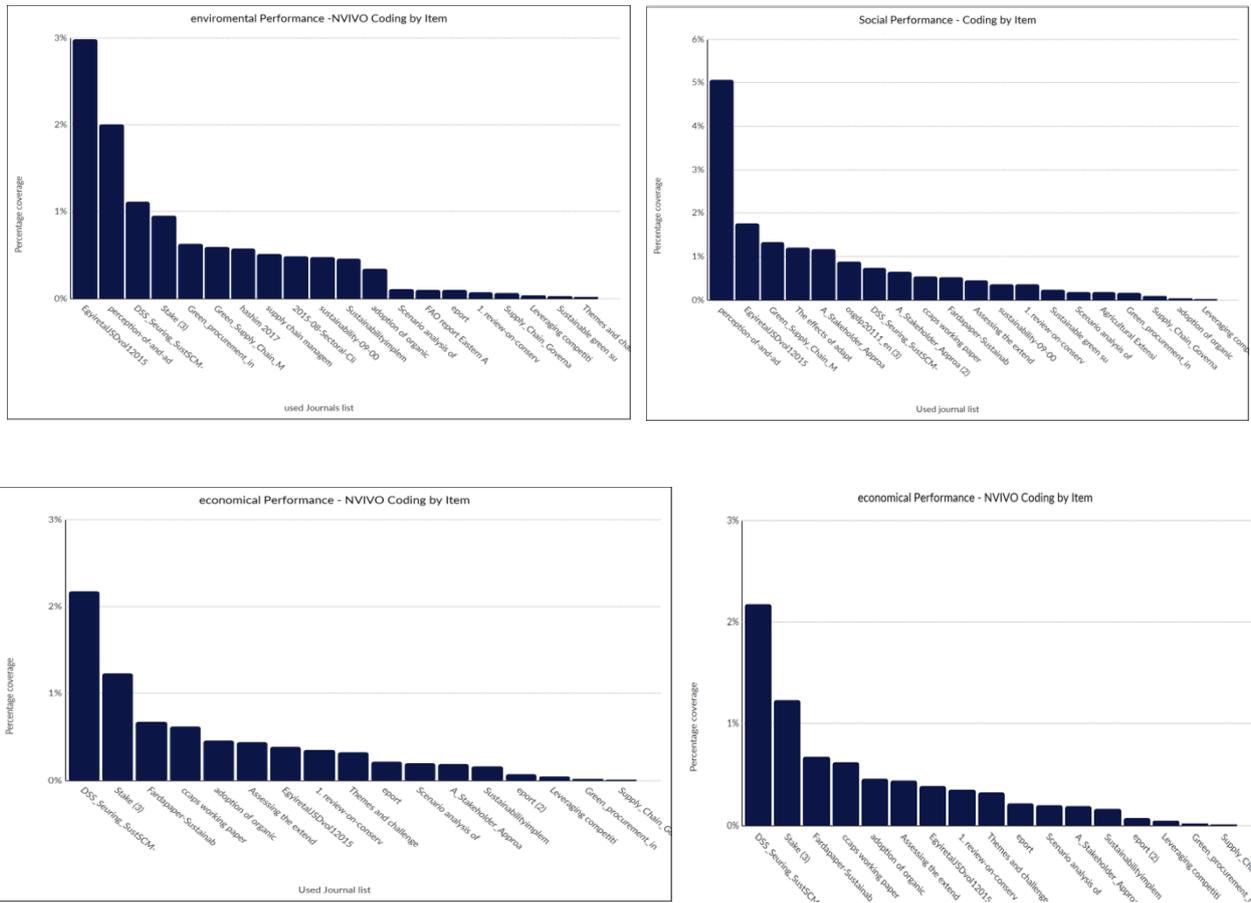
chain management. Figure 2 below presents graphics of the descriptive data.



Source: literature review conducted 2023/24.

Figure 2. The proportion of journals, conference papers, and literature review articles.

Figure 3 below presents the NVIVO code and used list of journal graphics of the economic, social, and environmental performance of Ethiopia's agricultural sectors.



Source: NVIVO result of literature review conducted 2023/24

Figure 3. NVIVO code and journal used graphics of the economic, social, and environmental performance.

5.2. Adoption of Sustainable Supply Chain Management Practices in Ethiopian Agricultural Sectors

5.2.1. Barriers and Enablers of SSCM Adoption

This literature review investigates that barriers that hinder the widespread adoption of SSCM practices among agricultural stakeholders in Ethiopia, such as lack of awareness, limited access to resources, and technological limitations, can help develop strategies to overcome them. Similarly, studying enablers, including government policies, incentives, and support mechanisms, can provide insights into effectively promoting and encouraging sustainable practices. According to [63] education has positive impacts on some strategies, to enable SSCM adoption. According to [34] there is a limited availability of literature that focuses on analyzing the influence of obstacles to sustainability on the adoption of SSCM practices from a quantitative standpoint. Additionally, it is worth noting that few studies have solely examined the environmental aspect in this context. The impact of corporate sustainability and supply chain management practices on performance can be influenced by the size of the firm, as it has been recognized as a significant contributing factor with a moderating effect [66].

5.2.2. Internal Driving Forces of Adoption SSCMP of the Agricultural Sector in Ethiopia

(i). Cost Reduction

Organizations are adopting sustainable supply chain management practices to reduce costs associated with resource consumption, waste management, and compliance with regulatory requirements. By implementing sustainable practices, they can optimize resource utilization and minimize expenses.

(ii). Environmental Consciousness

Some agricultural organizations are becoming increasingly aware of the environmental impacts of their operations. By adopting sustainable supply chain practices, they aim to reduce their carbon footprint, limit deforestation, promote biodiversity, and protect natural resources for long-term sustainability.

(iii). Reputation and Branding

Executing sustainable supply chain management practices can enhance an organization's reputation and brand image. Consumers and stakeholders are placing greater importance on sustainability, and companies that demonstrate environmental responsibility are likely to attract more customers and investors in some agricultural sectors, especially for export commodities.

(iv). Risk Mitigation

Sustainable supply chain practices help organizations mitigate risks associated with climate change, natural disasters, and resource scarcity. By diversifying their supply chain, implementing disaster preparedness measures, and adopting sustainable farming techniques, they can better withstand potential disruptions.

5.2.3. External Driving Forces of Adoption SSCMP of the Agricultural Sector in Ethiopia

(i). Government Regulations and Policies

The Ethiopian government has cascaded regulations and policies to promote sustainable practices in the agricultural sector even if implemented has its limitations. By complying with these regulations, organizations can ensure continued operations, access incentives, and avoid penalties.

(ii). Market Demand and Customer Preferences

Consumers are increasingly demanding sustainable and ethical products. Organizations that adopt sustainable supply chain practices can cater to these demands and capture a larger market share. Additionally, international markets may impose sustainability criteria for imports, creating a need for compliance.

(iii). Stakeholder Pressures

Various stakeholders, including Research centers, investors, and NGOs are actively advocating for sustainability in supply chain practices. These groups can exert pressure on organizations to adopt sustainable practices and conform to ethical standards.

(iv). Competitive Advantage

According to [35] farmers could adopt strategies in response to climate change by assuming the random utility maximization theory. Organizations that incorporate sustainable supply chain practices may gain a competitive edge. By enhancing efficiency, reducing waste, and improving sustainability, they can differentiate themselves from competitors and attract environmentally conscious customers this is common for export commodities.

5.3. Impact of Sustainable Supply Chain Management Practices on the Performance of the Agricultural Sector in Ethiopia

Sustainable supply chain management practices in the agricultural sector can have various positive impacts on performance in Ethiopia. Here are a few key points to consider:

5.3.1. Economic Performance

According to [31] the poorest farmers with few safeguards against climate calamities often live in areas prone to natural disasters by streamlining operations, agricultural businesses can achieve cost savings, enhance productivity, and maximize output. On the contrary, some researchers have discovered that the implementation of green supply chain management can adversely affect the financial performance of businesses. According to [32] integrating sustainable supply chain management into existing processes can lead to significant changes that may escalate the workload and expenses for enterprises, ultimately posing a threat to their economic interests. According to [35] financial resources can help farmers to meet transaction costs and invest in improved farming practices to enhance yields and reduce the adverse effects of climate change.

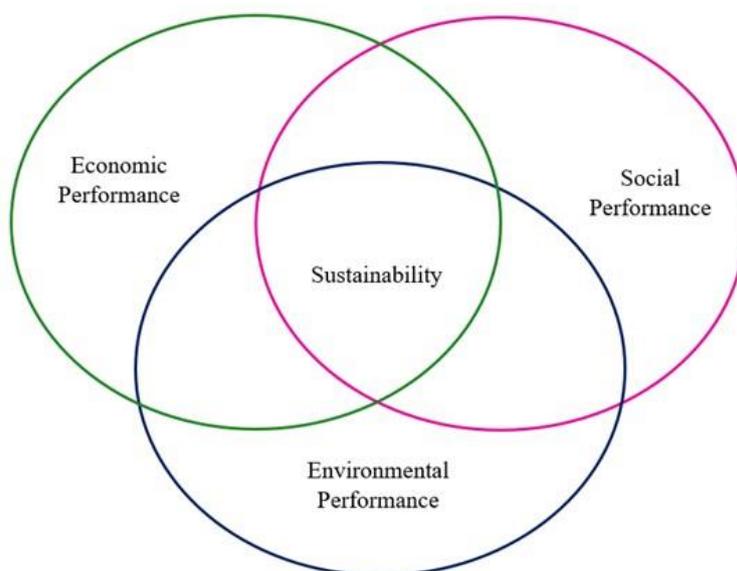
5.3.2. Environmental Performance

According to [18] non-consistent rainfall patterns, extremes in temperature, delayed start of the rainy season, and long dry seasons, Sustainable practices contribute to environmental conservation by promoting responsible agriculture. Measures

such as soil and water conservation, minimizing pollution from farming activities, and adopting eco-friendly farming techniques [1]. According to [14], by protecting the environment, the agricultural sector can ensure the long-term availability of resources and maintain ecosystem health.

5.3.3. Social Performance

Sustainable supply chain management practices often focus on quality control and safety standards. By implementing robust quality assurance processes, agricultural businesses can ensure that their products meet or exceed local and international standards. Social issues such as product safety and environmental pollution have caused widespread concern among researchers in recent years, and social performance is also considered to be a key factor in sustainable supply chains. research indicates that in addition to pursuing financial performance for shareholders, companies should also assume social responsibility and seek benefits for other stakeholders. According to [13] the social performance of companies stems from their diverse actions that foster social responsibility, while environmentally conscious behaviors of companies can enhance their social performance.



Source: literature review conducted 2023/24.

Figure 4. Sustainability Performance Perspectives.

5.4. Interacting Agriculture and (Sustainable) Development

The agricultural industry plays a vital role in the progress of a nation or a locality by significantly contributing to its economic and environmental development. The 2030 Agenda for Sustainable Development embodies such a vision one that goes beyond the divide between 'developed' and 'developing'

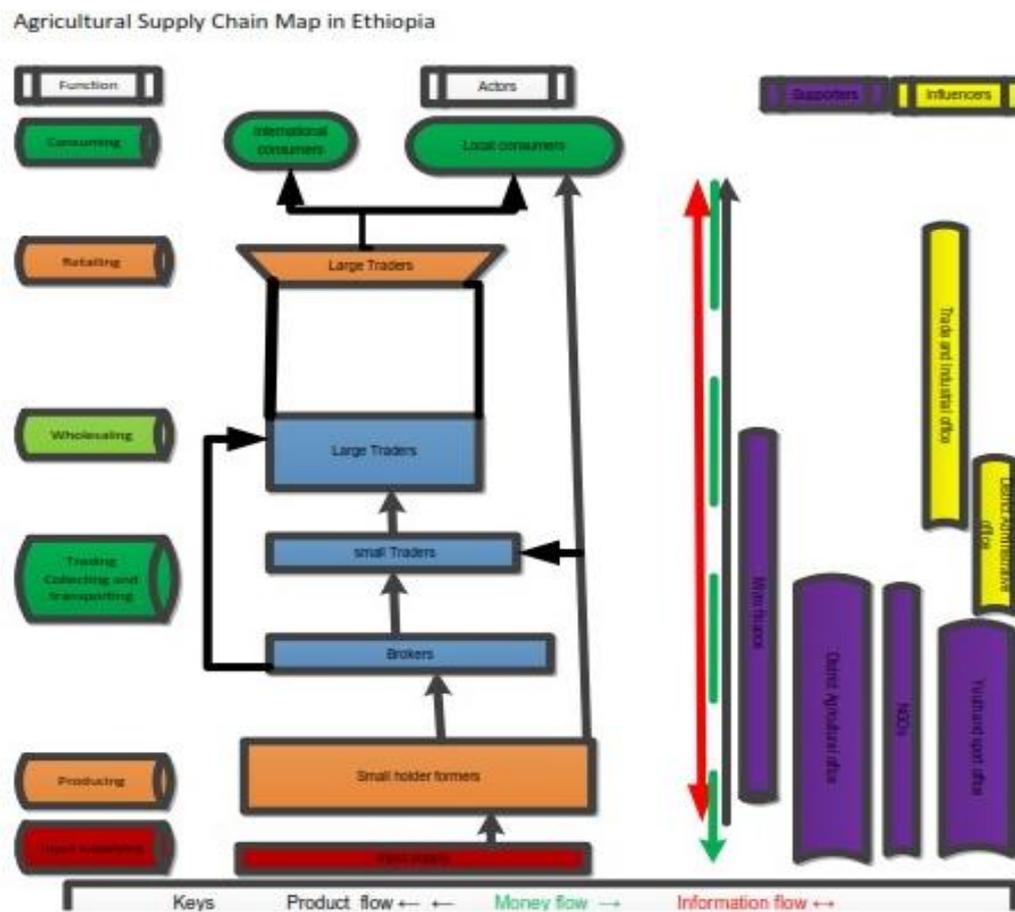
countries. Sustainable development is a universal challenge and the collective responsibility of all countries, requiring fundamental changes in the way all societies produce and consume [19, 20].

5.5. Sustainable Agricultural Supply Chain (SASC) in Ethiopia

In the agricultural contexts of Ethiopia, attaining sustaina-

bility involves addressing three key aspects: (a) profit, (b) planet, and (c) people, which involve improving living conditions and economic prospects in rural areas, thereby addressing the social challenges. The use of compost, animal manure, crop rotation, and intercropping has also been widely

applied. [59] report the use of organic manure and agroforestry systems as adaptation measures to climate change and drought and Figure 5 below shows the Agricultural Supply Chain map in Ethiopia.



Source: literature review conducted 2023/24.

Figure 5. Agricultural Supply Chain Map in Ethiopia.

In Ethiopia's agricultural sector, there is an emphasis on incorporating environmentally and socially responsible practices throughout different stages of the supply chain, which is known as sustainable supply chain management integration.

Table 1. Sustainable supply chain management practices and impact on agricultural sectors in Ethiopia.

Sustainable supply chain management impact in Ethiopia.	Common Sustainable supply chain management practices in the Agricultural sector of Ethiopia
<p>Environmental Impact</p> <p>Reduce the environmental footprint of agricultural activities such as minimizing water usage, promoting efficient use of fertilizer and pesticides, and adopting conservation practices like crop rotation and agroforestry. These actions contribute to mitigating soil degradation, protecting biodiversity, and reducing greenhouse gas emissions.</p>	<p>Organic farming: Farmers in Ethiopia practice organic farming techniques, which involve avoiding the use of synthetic fertilizers and pesticides and promoting the use of natural alternatives. This helps minimize the environmental impact and supports biodiversity.</p> <p>Water conservation: Ethiopia's agricultural sector adopts water conservation methods such as drip irrigation and rainwater harvesting. These practices ensure efficient water usage and reduce water waste</p>

	Sustainable supply chain management impact in Ethiopia.	Common Sustainable supply chain management practices in the Agricultural sector of Ethiopia
Social Impact	Supporting smallholder farmers and ensuring fair wages and working conditions, these practices contribute to poverty reduction, increased livelihoods, and improved social well-being.	<p>Crop rotation and diversification: farmers rotate crops to maintain soil fertility and prevent soil degradation.</p> <p>Certification and standards: a few farmers in Ethiopia often adopt international certification standards such as Fairtrade or Organic Certification and ensure that their products meet specific sustainability criteria and gain access to niche markets.</p> <p>Collaboration and knowledge sharing: Institutions in Ethiopia work together to facilitate knowledge sharing among farmers. This helps disseminate sustainable agricultural practices, technologies, and techniques, leading to increased adoption and shared learning.</p>
Economic Impact	By enhancing productivity, reducing waste, and optimizing resource utilization, farmers can improve their profitability and competitiveness in the market. Additionally, sustainability practices often attract environmentally conscious consumers, leading to increased demand and market access for agricultural products.	<p>Efficient inputs and waste management: The sector focuses on using organic and locally sourced inputs, reducing reliance on chemical inputs, and minimizing waste generation. Waste management practices such as composting and recycling are employed to reduce negative environmental impacts.</p> <p>Natural resource management: Ethiopia promotes sustainable land management to prevent deforestation and soil erosion. Forest conservation and reforestation efforts are also encouraged to maintain ecosystem balance.</p>

Source: literature review conducted 2023/24

5.6. Constraints and Opportunities of Sustainable Supply Chain Management Practices in Ethiopian Agricultural Sectors

The literature review illustrates that some of the major constraints and opportunities of sustainable supply chain management practices in Ethiopian agricultural sectors are outlined as follows;

Table 2. Major Constraints and Opportunities.

Major Constraint	Opportunities
<p>Infrastructure</p> <p>Limited and inadequate infrastructure, such as roads, storage facilities, and transportation systems, can pose challenges in efficiently managing the supply chain. This can lead to higher costs, delays, and potential product losses.</p>	<p>Organic and Specialty Markets</p> <p>Growing global demand for organic, fair-trade, and specialty agricultural products presents an opportunity for Ethiopian farmers to adopt sustainable practices and tap into premium markets.</p>
<p>Technology and Information Gaps</p> <p>Limited access to technology and information systems hinders effective supply chain management.</p>	<p>Certification and Traceability Systems Implementation</p> <p>Implementation of certification schemes and traceability systems can enhance transparency and build trust with consumers. This can lead to better market access and higher prices for sustainably produced agricultural products.</p>
<p>Financial Constraints</p> <p>Limited access to capital and financial services can restrict investments in sustainable practices, such as adopting new technologies, improving infrastructure, or implementing certification schemes.</p>	<p>Public-Private Partnerships</p> <p>Collaboration between government agencies, private sector entities, and international organizations can support the development of sustainable supply chain management practices. This can include investments in infrastructure, technology transfer, and Capacity-building initiatives.</p>
<p>Capacity Building</p> <p>Insufficient knowledge and skills of stakeholders involved in the supply chain, including farmers, processors, distributors, and regulators, can be a barrier to implementing</p>	<p>Expansion of Extension service</p> <p>Ethiopia has been committed to increasing its extension services to improve agricultural productivity and rural development.</p>

Major Constraint	Opportunities
sustainable practices.	Integrated Agricultural Extension Packages Farmer Training and Capacity Building: Extension services.
<i>Reduction in crop yields and decline in farm incomes [16]</i> <i>Land fragmentation</i> The already small size farmland of a family is further fragmented into very small pieces of land when the children inherit since it is divided among themselves [39] reported that in Ethiopia, land fragmentation resulted in food insecurity and increased the amount of time spent moving from one parcel to another that lowered agricultural output	<i>Expansion of private large farms especially Agro-processing and rural collection units.</i> Large-scale farming has gained attention in recent years and has advantages for Ethiopian agriculture such as Increased productivity, Employment opportunities Investment and infrastructure development and increase foreign investment
Climate change Ethiopia is vulnerable to climate change. It posed a huge challenge to Ethiopians. [2, 6] reported that Ethiopia has lost a cumulative level of over 13% of its current agricultural output between 1991 and 2008 followed by climate change	Climate Resilience Sustainable supply chain practices can contribute to building climate resilience in the agricultural sector. Practices such as nutrient cycle compost making, water conservation, soil management, and crop diversification can help mitigate the impacts of climate change and improve long-term sustainability

Source: literature review conducted 2023/24.

5.6.1. Challenges of Conservation Agriculture in Ethiopia

According to [36], the primary challenge of CA adoption is the assumption that soil tillage is essential for agricultural production. Other challenges include those of intellectual, social, technical, environmental, and political characteristics. The key challenge with mainstreaming CA systems relates to problems with up-scaling which is largely due to the lack of knowledge, expertise, inputs (especially equipment and machinery), adequate financial resources and infrastructure, and poor policy support. Overcoming traditional mind-sets about tillage by promoting farmer experimentation with this technology in a participatory way will help accelerate adoption [50].

5.6.2. Challenges in Developing Sustainable Supply Chain in Agricultural Sectors of Ethiopia

According to various sources, the primary difficulties faced by the agricultural industry in Ethiopia's SSC (Sustainable supply chain) sector can be outlined as follows:

a. Infrastructure Limitations

The yields from rain-fed agriculture were reducing due to climate change by up to 50% by 2020 [33] in most African countries. Inadequate infrastructure, including transportation, storage facilities, and cold chain systems, poses a significant challenge to developing sustainable supply chain networks in Ethiopia.

b. Information and Communication Gaps

The presence and proficiency of information and communication technology (ICT) differ throughout Ethiopia.

c. Access to Finance

The creation of sustainable supply chain networks is an

important investment in arrangement, technology, and capacity enhancement. However, many agribusinesses in Ethiopia face a typical obstacle in the form of insufficient access to financial resources.

6. Conclusion

According to this literature review, it has been found that there is an important and constructive relationship between the performance of the agricultural sector and the three elements of sustainable supply chain management practices, namely economic, environmental, and social sustainability. This highlights the importance of adopting sustainable supply chain practices for the overall performance and long-term viability of the agricultural sectors in Ethiopia and directs the crucial challenges and opportunities to implement SSCMP in the agricultural sectors. By utilizing NVIVO as a data analysis tool, a systematic exploration of the existing knowledge base was conducted. The findings highlight the necessity of ongoing efforts to promote and implement sustainable practices in the Ethiopian agricultural sector. This should consider the barriers that may impede adoption, as well as the key internal and external factors that drive the adoption of sustainable supply chain management. Moreover, it is essential to consider the constraints and opportunities associated with such practices to gain a competitive advantage; it is recommended that the agricultural sectors in Ethiopia be actively involved in sustainable practices.

Due to a lack of funds the researcher in the study encountered difficulties in acquiring the NVIVO software. As a solution, the researcher resorted to utilizing the trial version to overcome these financial constraints.

There are various areas within the adoption of SSCM practices in Ethiopia's agricultural sector that require further

investigation, presenting opportunities for future research. This article suggests some directions for research that could improve our understanding of the topic and offer valuable insights for both academic and industrial purposes. These include incorporating technology into SSCM, promoting stakeholder engagement and collaboration, and considering all sectors and supporters within the agricultural supply chain.

curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing – review & editing

Simon Peter Nadeem: Project administration, Supervision, Writing – review & editing

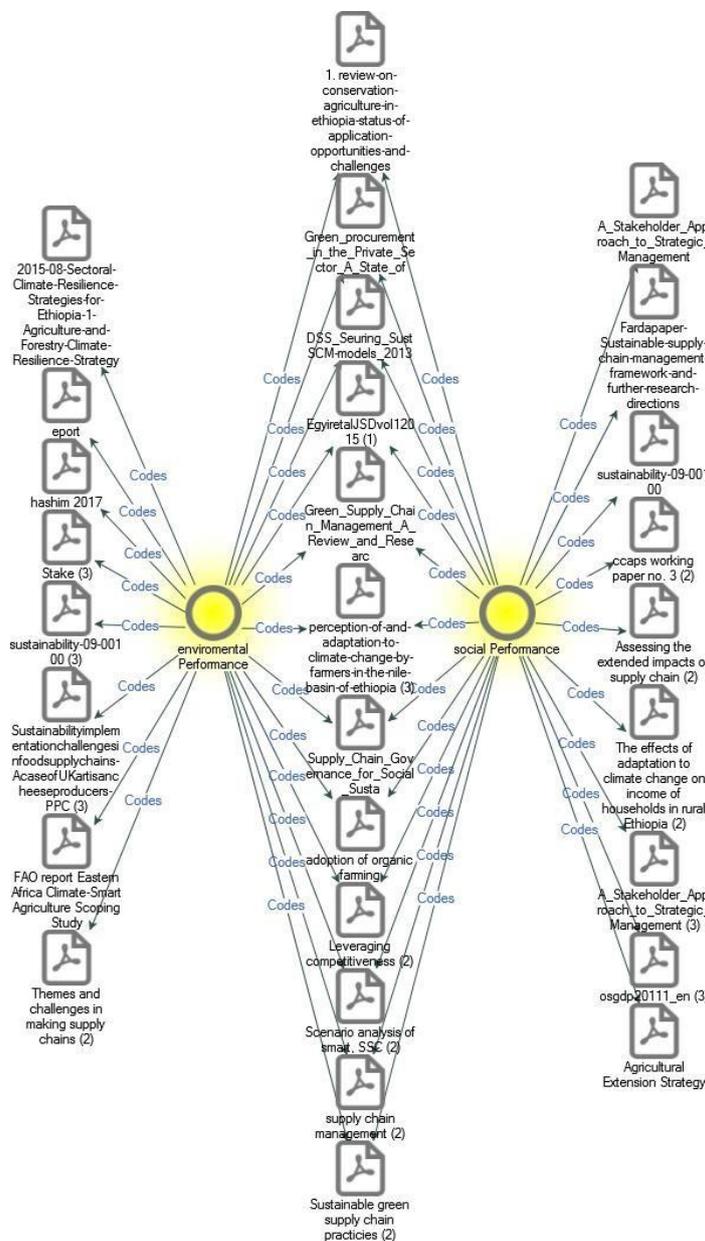
Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

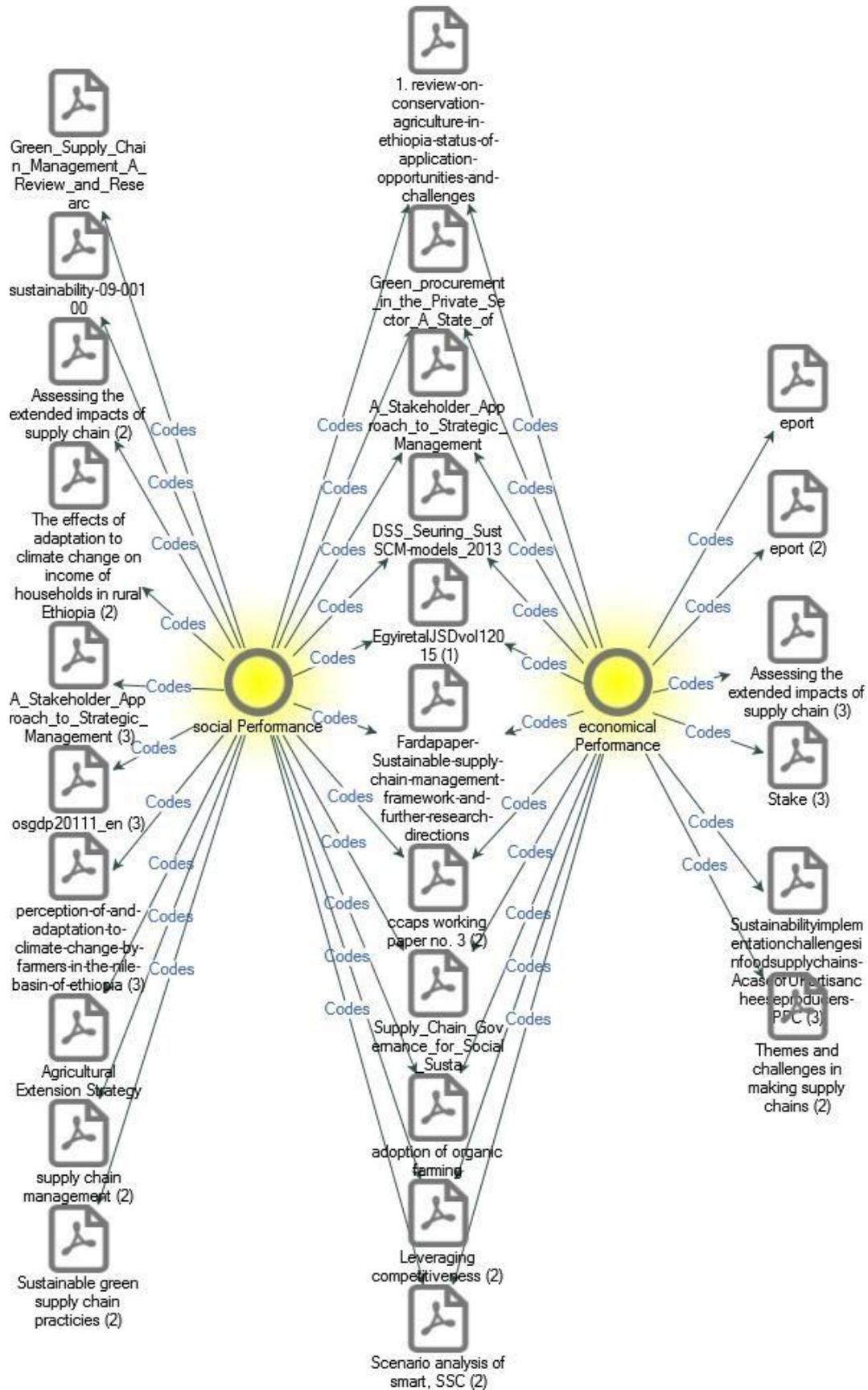
Shimelis Gizachew Desalegn: Conceptualization, Data

Appendix



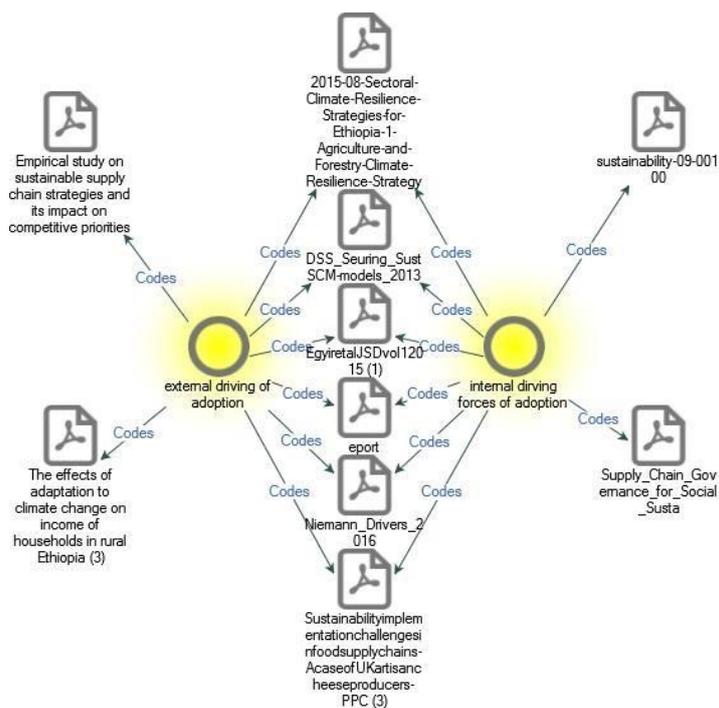
Source: NVIVO result of literature review conducted 2023/24

Figure A1. Some information from NVIVO code comparison of the environmental performance vs. social performance.



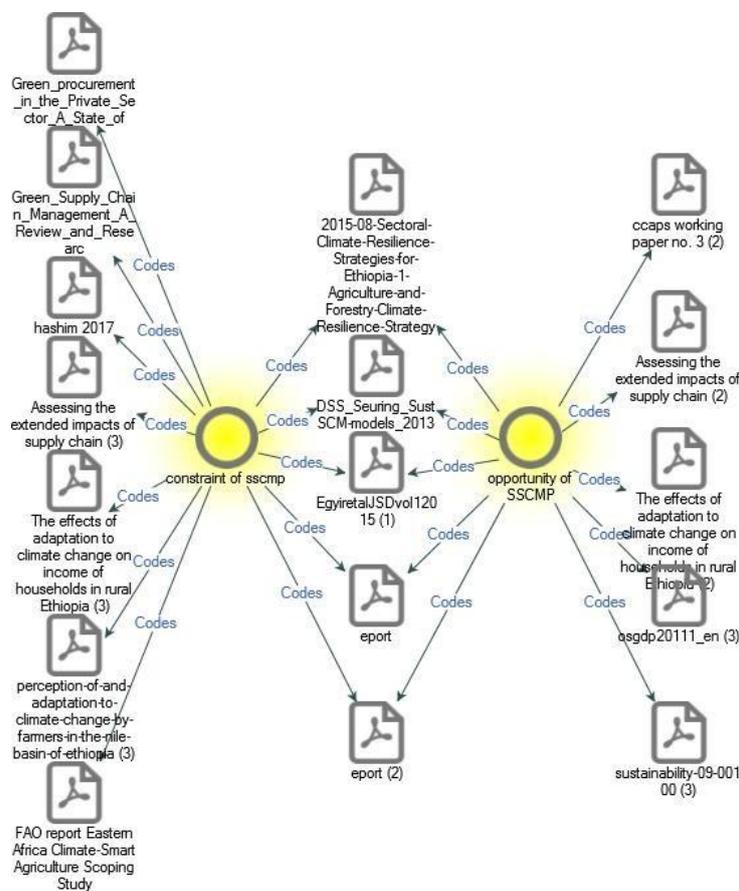
Source: NVIVO result of literature review conducted 2023/24

Figure A2. Some information from NVIVO code comparison of the social performance vs. economic performance.



Source: NVIVO result of literature review conducted 2023/24

Figure A4. Some information from NVIVO code comparison of the internal driving force of adoption SSCM vs. external driving force of adoption SSCM.



Source: NVIVO a result of literature review conducted 2023/24

Figure A5. Some information from NVIVO code comparison constraints of SSCM practices in the Ethiopian Agricultural sector vs. opportunities SSCM.

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