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SUSTAINABLE AGRIFOOD VALUE CHAIN TRANSFORMATION IN DEVELOPING COUNTRIES: INDONESIA'S CASHEW SECTOR CASE

A thesis with publication presented in partial fulfilment

of the requirements for the degree of

Doctor of Philosophy

in

Agribusiness

Massey University, Palmerston North

New Zealand.

Dwi Ratna Hidayati

2023

Declaration

I, Dwi Ratna Hidayati (Student ID: [redacted]), declare that this thesis entitled "Sustainable Agrifood Value Chain Transformation in Developing Countries: Indonesia's Cashew Sector Case" submitted to Massey University for the degree of Doctor of Philosophy is the outcome of my own research work. Acknowledgement is given where material from other resources was used. I also certify that the thesis has not been presented, in whole or partly, for any degrees or diplomas.

Executive Summary

The value chain approach has been extensively explored to assist the development of the agrifood sector in developing countries. Agrifood value chain players in developing countries are increasingly moving into higher-value markets in order to increase their profits. The value chain lens can monitor the dynamic of the chain arrangement through governance activities and assess the value-adding source activities. In the meantime, higher value markets have imposed a new value focus on sustainable standards throughout the chain, demanding a "sustainable value chain" practice. A sustainable value chain requires the players to obtain a balanced activity in the economic, social, and environmental aspect. Many studies have sparked investigation in the sustainable value chain, however, the ability of developing countries' value chain to transform their practices remains a contentious issue.

Three significant problems could seriously impede the transformation process. First, most agrifood value chain transformations in developing countries begin with an outdated, traditional value chain. Second, a large number of smallholders are the main players in developing countries, who are typically cut off from the majority of value chain operations in terms of governance and value addition. Third, players from developing countries primarily develop practices with economic priority for alleviating their poverty, which frequently endanger social and environmental aspects.

This study examines how to enable the sustainable agrifood value chain transformation in developing countries. Despite the fact that numerous studies have found a wide range of useful indicators, the structure of the transformation mechanism is frequently ignored. Therefore, this study focuses on synthesising indicators and finding the most effective mechanism to deal with sustainable value chain transformation. It is found that a framework that integrates sustainability, governance, and value addition dimensions has provided a strong foundation for facilitating and anticipating the sustainable value chain transformation in developing countries. Sustainability aspects must be incorporated into governance activities, in order to lead into value addition activities required by higher value markets.

The proposed framework was applied in the cashew sector of Indonesia, by employing a qualitative method followed by a quantitative method. The qualitative method was used as an initial assessment of the current value chain practices. In 2020, a total of 25 key interviews with value

chain players and stakeholders in Madura Island of Indonesia were conducted. The assessment specifically focuses on the evaluation of maturity level of practises (based around traditional chain, managed chain, and best practice), using governance and the value addition dimension. The findings confirm that there was a disconnect in practices among value chain players. Smallholders followed the traditional value chain, whereas major wholesalers and exporters followed the managed value chain. It was then proposed that value chain transformation be tailored in step-by-step trajectories to align smallholder practices with other players. Before all value chain players can advance to the best procedure, the practices of smallholders must first be aligned to a managed chain level.

Following up on the findings, the enabling factors for a sustainable value chain transformation were assessed in order to fully align with higher value market demands. Smallholders' perspective was used as the focus of attention since they are the most vulnerable player operating in the value chain and prone to sustainability. In 2021, a quantitative method was used with 159 smallholders as respondents in the study area. The results showed that farm practice milieu and information-communication are the strongest factors to enable sustainable value chain practice. It was followed by stakeholder support, certification orientation and market expansion as moderate factors in order to amplify the process of practice transformation. Meanwhile, pre-harvesting value, value-capturing, and post-harvest value are the weak factors which tend to abate transformation.

Given these factors, the final step of investigation is to examine the actors who are most compatible with higher value market demands. The heterogeneity of smallholders' perspectives towards sustainable value chain practices was evaluated. Four clusters were discovered and prioritised as accelerators, progressors, inattentive, and conservative. Understanding the heterogeneity of smallholders allows for a more precise treatment, and prioritisation in intervention is required to accelerate alignment with higher value markets.

Overall, this study stands out in advancing the enabling mechanism for a sustainable value chain transformation through a systematic and structured process. The study lays the groundwork for future sustainable value chain studies which focus on the mechanism of transformation, using a step-by-step procedure, prioritised factors, and actors. Practitioners could independently evaluate and tailor their most effective transformation approach. Furthermore, policymakers could set the intervention into a more targeted agenda.

Acknowledgements

Bismillahirrahmanirrahiim, بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيم

In the name of Allah SWT, the most gracious and the most merciful. "…*Allah will raise to high ranks those of you who believe and are endowed with knowledge. Allah is well aware of all that you do*" (Quran, Al Mujadilah 58:11). Praise to Allah for the blessing, affectionate, and guidance in each step that I took, making what I once believed to be **impossible** now seem to be **I'm possible**.

Special thanks to MFAT for the New Zealand Scholarship (NZAS), which has given me an amazing opportunity. This chance expands, not only my academic growth, but also opens the door to many other opportunities. Thank you to the NZAS team, especially Jamie Hooper and Saba, who provided me with the best service ever.

My wonderful supervisors, I will miss every discussion, hearty laughs, and challenges you gave me.

Dr Elena Garnevska, I am at a loss for words to express my sincere gratitude and honour for each wonderful support and advice you gave me throughout this amazing journey. You constantly lent me a helping hand, provided the brightest flashlight to my limited knowledge, challenged my way of thinking, and inspired my courage. Also, I appreciate you allowing me to repeatedly bang on your office door whenever I needed it. For me, these times were priceless.

Prof Paul Childerhouse, who provided me (this high maintenance student) with incredible support. I was repeatedly challenged by your brilliant idea to think 'divergently'. Every agreement about 'disagreements' now appears to be a beautiful memory. For the rest of my life, I will treasure the meeting recordings. Additionally, I can't thank you enough for helping me with your 'bonus' scholarship.

Dr Thiagarajah Ramilan, what a wonderful opportunity it was for you to enter my PhD journey at such a crucial point and provide me with such strong support. I also want to thank you for giving me a variety of opportunities, helping me to develop my skills, and allowing me to support the ASEAN food value chain short course. Working with you was more than a pleasure.

My beloved friends,

Thank you, my friends, who provided me with a colourful life during my stay in New Zealand. Fernando Sanjaya- who helped me in my early years. Office-mates AHB 2.10, Gautam Shrestha (thanks for the map, bro), Brian Mc Levin, and Shanika; and AHB 2.12 (Sam-*the frenemy scientist* Wilson, Priyanath Jayasingh,

Marcos, Amanda, Rebekah Wood, etc), beautiful crazy Thanh-Thi-Cherry Nguyen family, Dinesha Jayawardana for statistical consultation, badminton club , beautiful girls wanna have fun group (Iqra', Kassanita Ova, Nidhi Shrivastav, Rupsa, Michelle, and Ling Hu), agribusiness club friends (Alex et al), IPGMS, MUSA (especially Negin), the Indonesian friend-team (special to my batch Tria and Diah), lunch-coffee mates, and Sharon Wright-for always being available when we need you. I can't mention all of my sensational friends individually. I appreciate it very much, mates.

My dear colleague at the Trunojoyo University of Indonesia, especially in the Department of Agribusiness, for the great support in so many things that I have lost count. Also, thank you to the Agricultural Faculty team for their amazing assistance, I appreciate it all. I am also appreciative of the help I received from the Kabupaten Sumenep Government, the cashew centre, and all other parties involved in the research.

My Family, the deepest gratitude may not be enough for their unconditional love…
Taufani Sagita, my beloved husband, for the incredible love, selflessness, and unwavering support. As always, you are my strength. My lovely son Syailendra Pratanu Sagita, this endeavor would not have been possible without him standing by my side at all times.

For my parents, *you raise me up, so I can stand on mountains, to walk on stormy seas, to more that I can be.* I want to say to Drs. Nadji Sutikno, M.Pd, my late father who passed away during my study, "Dad, as you taught me, I paved this PhD journey beautifully and strongly." My mother, Tutik Syahwanti, I'm extremely grateful for all of your prayers, motivations, and all these tears. My mother-in-law and father-in-law, who staunchly support me (my lovely Hanum Uratmi and Sugito). My brothers and sisters (Sidiq Hidayat, Hadi Fatchur Rachman, Rahma Furi Sagita) within their family, thank you for your love and compassion.

Last but not least, thank you to everyone who put me in your pray and best wishes.

Alhamdulillahirobbil 'Alaamin, **الحمد لله ربّ العالمين**

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CHAPTER 1
Introduction

1.1 Research Background

The value chain concept has become an important topic in the development of the agrifood sector in developing countries. The value chain lens offers an approach capable of scrutinizing the complex role of multi-actors within the dynamics of the agrifood system, through governance and the value addition dimension. Agrifood governance is concerned with market dynamics in order to organise the chain rule (Sjauw-Koen-Fa et al., 2016). Meanwhile, value addition is concerned with how each stage contributes to the overall value of the product (ILO/FAO/IFAD, 2010; Norton, 2017). However, the value chain concept is not only about the sequence of activities in value-creation by converting the raw materials into the final products, but also includes the interactions connecting these different activities (Vroegindewey & Hodbod, 2018). It means that all agrifood actors must collaborate in order to respond to any changes such as new requirements in product demand or the way the chain is serviced. Furthermore, the value chain embraces the idea of whole range activities to carry out services or products from the conception stage up to final sale at either local, national, or global market (Kumar & Rajeev, 2016). The value chain concept, therefore, allows the transformation needed by developing countries' value chains and capable of following the context.

Developing countries' agrifood value chain players are under increasing pressure to transform into the higher-value and global market (Abraham & Pingali, 2020; Hidayati et al., 2021b; Reardon et al., 2009). The majority of studies indicate that globalisation, through industrial structure, technology, and the consumerism trend, has been the main driver of value chain transformation in developing countries (Collins, 2014; Cucagna & Goldsmith, 2018; Reardon et al., 2019). Since the world has been a marketplace with a concentration of modern-retail (supermarket) and food services, the global economy no longer guarantees market access based on the physical location of food production and processing (Collins, 2014). Therefore, many agrifood value chain players in developing countries, especially smallholders, are transforming to the higher-value market to capture a greater benefit (Hidayati et al., 2021b; Reardon et al., 2019). In most cases, value chain transformation is also viewed as a strategy for improving the players' practice and alleviate their

poverty (DFID, 2008; FAO, 2014; Maspaitella et al., 2018). It follows that the global players in the high value food industry also increasingly focus on sourcing from developing countries (WTO, 2019). Regardless of opportunity, developing countries' value chain transformation require further investigation.

The global and higher-value food markets have raised expectations in food quality and safety, contributing to the importance of sustainability as the new value focus. Sustainability practice has been elevated to the top priority list which is aligned with food security concern in terms of sustainable production and consumption (Borsellino et al., 2020; Meybeck, 2016). Value chain transformation, therefore, frequently involves enabling the business environment as well as social-environmental standards, as an addition to product quality, differentiation, and system efficiency (FAO, 2022; Nutz & Sievers, 2015). It also means that the value chain players in developing countries are obliged to create an acceptable mutual outcome from production to consumption (FAO, 2014).

Transforming developing countries' value chain into higher value markets while adhering to the requirement of sustainability practices has been widely observed as a challenging task. The majority of value chain transformations in developing countries begin with the traditional chain which featured traditional norm practices (Mishra & Dey, 2018). In addition, a large number of smallholders serve as the primary raw material suppliers, who lack the capacity, technical skills, and access to markets (McCullough et al., 2008; Reardon et al., 2019; Sjauw-Koen-Fa, 2012). Smallholders also lack bargaining power in markets (Garnevska et al., 2011; Widadie et al., 2021). For these reasons, smallholders are frequently disconnected from value chain participation in terms of governance and value addition activities. Furthermore, their economic priority in value chain practice poses a risk to the development of sustainable practices (Schoon et al., 2013). The value establishment could put a strain on natural resources, resulting in environmental damage and a shift in social-traditional norms (DFID, 2008; Sulewski et al., 2018).

Given these numerous constraints, academics have continuously developed approaches which are suitable for the context of developing countries. Whilst the Sustainable Development Goals (SDGs) have since become a sustainable benchmark to support sustainability practice on a global scale (United Nations, 2013), however they still cover a wide range of industries and continue to develop indicators based on the context. Some approaches that have often been proposed for developing countries include value chain development (DFID, 2008; FAO, 2014), higher-value

market linkage (Borsellino et al., 2020; Royer et al., 2016), and certifications (Schoneveld et al., 2019). Nonetheless, many of these studies less clearly structured the process of facilitating and anticipating the sustainable practice transformation. The mechanism for prioritising actions in order to direct transformational change is still under-utilised. Furthermore, the challenge within the current approach is the reliance on a top-down strategy, where the role of the global lead firms is dominant in organising and establishing the chain's rule. Global players sourced from developing countries producers while controlling and dominating value-adding activities (Hernández et al., 2014; Hidayati et al., 2021b; Trienekens, 2011). As a result, the value chain transformation may lead to increased inequality practice, which weakens the players in developing countries.

Since the value chain transformation has profound consequences in developing countries, it is imperative to develop an applicable framework to assist the transition into a sustainable way. This study fills the gap in knowledge by investigating the agrifood value chain transformation process in a developing country and develop a structured mechanism for moving forwards to sustainable practice. This will advance understanding of the mechanism, providing scholars, actors, and relevant policymakers with a solid basis on which to develop future sustainable value chain practices within the context of developing countries. Sustainable value chain is important because it is a new global problem which will help to achieve the Sustainable Development Goals.

1.2 Key Concepts

The value chain concept is used as the key foundation. Next, the agrifood value chain and sustainability concepts are explored within the context of developing countries.

1.2.1 Value Chain

The basic concept of value chain, as popularized by Michael Porter, emphasises competitiveness as the key to a company's success with the value of the customer as the focal point. Value chain is basically defined as value-added interlink activities which distinguish primary and supporting activities from production up to the customer stage (Christopher, 2011; Godfrey, 2016; Harmon, 2014; Porter, 1985). The value chain concept, however, had been critiqued for focusing on a single firm activity lens (Wang & Li, 2009), whereas, the businesses have moved their focus from competing against individual firms to competing against another

'chain' and/or other 'chains' (FAO, 2014). In this regard, the chain members must closely cooperate to create value along the chain to win the business.

The value chain concept development further centre the idea around the dimensions of *the governance* in order to arrange the chains' integration, and *the value addition* to contribute more value. The value chain needs both the consumer's value and an efficient chain (Zokaei, 2010). Governance can see the control of power in a value chain for rewards and risk-sharing (Boehlje, 1999; Gereffi et al., 2001; Hernández et al., 2014; Kaplinsky & Morris, 2000). Equally important, each stage must add value (Norton, 2017). More complex activities notice stages of activities that only facilitate value-adding activity, in which a non-value-adding stage involved in the chain should be removed (Harmon, 2014). The value chain idea is further elaborated as a process of creating added value which develops interrelationships between activities (Ensign, 2001; Hastings et al., 2016) and networking (Christopher, 2011; Hanssen, 2010). By this, the value chain idea development also progressively changes the orientation from commodity business into a task business (WTO & IDE, 2011).

Using the above perspectives, the value chain idea was continuously developed to produce more substantial opportunities to compete. As an example, later on, the Global Value Chain (GVC) idea was introduced (Gereffi et al., 2005; Kaplinsky & Morris, 2000). The GVC concept had progressively removed the business boundaries worldwide. Chartered Global Management Accountant/CGMA (2014) reveals that a large flow of capital, services and technology increased the business opportunities for many countries including developing countries. Other studies explored value chain integration with a broader system (such as supporting business functions and a regulatory system), which influence the operation (Godfrey, 2016; Nutz & Sievers, 2015). The system involves important parties such as the non-profit sector, business organization and government, who potentially release the new rules which impact the value chain operation. Value chains, therefore, must also be ready to adjust to the changes affected by the system.

1.2.2 Agrifood value chain

Despite the constant development of the value chain concept, agrifood value chain carries specific characteristics. The agrifood value chain is primarily divided into stages which are similar to those of the general value chains (inputs, production, processing, and delivery to consumers)

(Cucagna & Goldsmith, 2018; Humphrey, 2006), however, each stage contain operations which may be unique.

Agrifood value chain stages take food safety and quality considerations as critical aspects (Trienekens, 2011). The *input stage,* consisting of fertilizer, biotechnology, and farm equipment, serves farmers or farming company in the production stage (Cucagna & Goldsmith, 2018). There are dominant companies with certifications which are closely related to control over their intellectual properties (Humphrey, 2006). Next, the *production stage* produces raw food materials with high dependency on environmental sources such as soil, water, sun, and other relevant agro-ecological elements (DFID, 2008; Nastis et al., 2019; United Nations, 2013). This stage serves mostly food processors and industry for further processing activities (Cucagna & Goldsmith, 2018), however, the reliance on natural sources had led to vulnerability in terms of stability and quality of supply. *Processing stage* consists of a series of manufacturing activities to process the raw product into branded or unbranded food products (Cucagna & Goldsmith, 2018). This stage covers a wide range of activities which involves fresh food or processed food, value added (Humphrey, 2006). Since agrifood products are perishable (Norton, 2017), the agrifood sector's processing is often sensitive to the raw market behaviour (Zocca et al., 2018). *Distribution Stage* is the latest stage of the agrifood value chain which comprises grocery retail, food distribution and service (Cucagna & Goldsmith, 2018). This stage is not only about the size but also the relationship with end consumers (Humphrey, 2006). Food products are often associated with the health and nutrition issue (Hansson et al., 2019; Manikas et al., 2019) and, therefore, the attributes of agrifood product has direct impact on consumers (Collins, 2014; Zuberi et al., 2016).

The aforementioned stages demonstrate how crucial, yet challenging, it is for the agrifood chain actors to play the governance role in order to generate value addition. Therefore, *agrifood governance* highlights the significance of chain integration via vertical coordination and horizontal coordination, which should be supported by information flow (Hidayati et al., 2021a). Vertical coordination is recognised as the key to understanding the agrifood chain arrangement such as the need to shift from spot market transactions into market interlinkages and contracts; from local sourcing into multi-sourcing either national, regional, or global networks; and from demand for public to private standards (Reardon et al., 2009). It follows that horizontal coordination is required in order for producers (mostly smallholders) to collectively gain power in the market such as via cooperatives or farmer groups (Garnevska et al., 2011; Maspaitella et al., 2018; van Dijk & Trienekens, 2012). To support vertical and horizontal coordination, information flow identifies an

accuracy, strength, cost effectiveness, speed, and transparency of messages among participants (Boehlje, 1999). Meanwhile, in order to generate *agrifood value addition*, commodity nature (i.e. perishability level, production frequency, type of use), processing technology (i.e. cost and complexity), and product use are all factors to consider (Mishra & Dey, 2018).

1.2.3 Agrifood value chain transformation in developing countries

Although operating the agrifood value chain is challenging, the transformation of developing countries' players towards higher-value markets on a global scale is a topic that is increasingly discussed in literature. The key principle of agrifood value chain transformation is a chain shifting into higher value chain practice through development of activities (Reardon et al., 2009). In order to develop the value chain activities, the popular concept introduced for developing countries was the value chain upgrading, with four key options: process, product, function (inter-chain), and intra-chain (Gereffi et al., 2001; Kaplinsky & Morris, 2000). According to Mitchell et al., (2009), value chain upgrading is a critical tool for impoverished poor players in developing countries to improve competitiveness and progress into higher-value activities.

In order to distinguish the value chain achievement after the upgrading process, some studies note the necessity for a value chain transformation stage. Developing countries frequently start with a traditional value chain and progress to a modern value chain (such as a supermarket) or global chain market (Antoniou et al., 2012; Gómez & Ricketts, 2013; Hanssen, 2010; ILO/FAO/IFAD, 2010; Reardon et al., 2019). The most notable difference between modern domestic and modern global markets is governance power, with the leading firms in the GVC wielding significant influence over business (Gereffi et al., 2001; Kaplinsky & Morris, 2000). Global value chains are also considered to increase more opportunities for technology transfer and improve agricultural productivity (FAO, 2022). In terms of value addition, branded, certified, and private standards have always been the top priorities in GVC (Collins, 2014; Reardon et al., 2009).

Despite the opportunities to move into higher value markets, many studies have found that transforming agrifood value chain practice in developing countries is far from simple. The value chains of developing countries often transform into global markets with varying, and often unstructured practices, which frequently result in an immature integration (Lee et al., 2012). Therefore, value chain transformational activities must be carefully examined and developed in

light of the context. In developing countries, the practice is generally featured by traditional norms (DFID, 2008), which primarily operate in informal markets with asymmetrical information and high transaction costs (Mishra & Dey, 2018). Many farmers and buyers of unsegregated commodities have traditionally dominated market arrangements (Thorpe, 2018). Intermediaries are also the most common players in developing countries (FAO, 2015). In most cases, intermediaries have critical roles such as providing input support, post-harvest marketing, and loan financing (Mishra & Dey, 2018; Sjauw-Koen-Fa, 2012; Vroegindewey & Hodbod, 2018). By this practice, the traditional value chain hardly competes with organized chains which have an effective cost to deal with safety and quality (McCullough et al., 2008).

The value chains operation in developing countries are also highly reliant on smallholders as raw material suppliers (Bokelmann & Adamseged, 2016; Mishra & Dey, 2018). Smallholders are frequently excluded from governance and value addition activities due to a lack of resources and capacity to participate in chain activities or create more value. The World Bank defines smallholders as those who have less than two hectares of farmland (Sjauw-Koen-Fa et al., 2016). With the limited size of operations, smallholders are confronted with technical constraints as well as lack of institutional coordination (Bokelmann & Adamseged, 2016; FAO, 2022). Therefore, smallholders frequently experience an unequal relationship and are regarded as being isolated from the more lucrative market (Thorpe, 2018). In the meantime, smallholders contain a large population group who are heterogeneous. Their characteristics and challenges differ depending on geography, the political and socioeconomic circumstances, and the influence of historical institutions in which they are located (Abraham & Pingali, 2020; Mutyasira, 2020). Further exploration in the value chain transformation of developing countries, therefore, must pay close attention to the precarious position of smallholders and their heterogeneity in order to comply with increased regulations in higher value markets and accelerate the transformation of value chain.

1.2.4 Significance of sustainability in agrifood value chain

The concept of sustainability has piqued the interest of many people around the world, and it has been extensively researched from various backgrounds and perspectives, including governments, businesses, social and environmental activists (Giddings et al., 2002; Janker & Mann, 2018). The first sustainability issue is believed to arise due to inter-and intra-generational issues (Ang & Passel, 2012; Gutés, 1996). The World Commission on Environment and

Development (WCED, 1987) implied the sustainability concern about social equity between generations and within each generation. Others addressed the definition of sustainability as a practice that requires people to collaborate towards a system for a good quality of life by a fair share of the planet's resources (Schoon et al., 2013). As a result, later on, sustainability reflects the demand for systematic global distribution actions on the sub-systems of environmental, social, and economic distribution (Choudhury, 2018; United Nations, 2013).

The sustainability concept offers insights to improve agrifood value chain practice in a significant and long-term manner, further known as sustainable value chain. Sustainable value chain stressed the idea on enabling all actors throughout the chain to produce high-end value along with sustainability practice. As food safety and quality are the most important concerns in the agrifood value chain, how food is produced and delivered is important. FAO (2014) defined a sustainable agrifood value chain as a series of value-adding activities (from farm to the subsequent firms) which transform agrifood products to be sold to consumers and disposed of after use, in a profitable manner that has broad-based societal benefits and does not permanently deplete natural resources. Aligned with this, more pressure from the wider public such as the World Health Organization (WHO) has urged value chain actors to embrace sustainable production and consumption as a critical component of food security orientation (Berry et al., 2015; Morone & Cottoni, 2016).

Understanding the concept of a sustainable value chain would necessitate a thorough understanding of the dimensions within the sector. The sustainable dimensions in the agrifood lens, according to Yunlong & Smit (1994), typically include *the environmental dimension* for the biophysical processes, productivity, and functioning ecosystems; *the social dimension* for fundamental human needs on the food and social level within the culture and, finally, *the economic dimension* for long-term benefits for the agricultural sector actors. However, each sustainability dimension should be viewed as a nested link, where human actions take place within the environment and are dependent on it (Giddings et al., 2002). Therefore, a sustainable agrifood value chain is more than just a set of indicators; it is a subset of an integration system (Hidayati et al., 2021c; Sulewski et al., 2018). The value chain is an economic-based activity which includes both social and environmental aspects. Natural capital, human knowledge and skills, and social structures, will be combined to create products or services that will be supported by machine, finance, and infrastructure (Oertwig et al., 2017), in the meantime, products are taken from and end up in the environment (Giddings et al., 2002). Since the sustainable value chain requires a

combination between the value chain and sustainability approach, FAO (2014) further depicts a sustainable value chain dimension as follows.

- A value chain is considered economically sustainable if each stage activity to create value, in collaboration with the support provider, results in a commercially viable or profitable product.
- A socially sustainable value chain refers to value chain creation that is both culturally and socially acceptable throughout the chain.
- The environmentally sustainable value chain refers to the actor's ability to result in little or no negative environmental impact from value-adding activities where possible and instead result in a positive impact.

While incorporating sustainable practice into the agrifood value chain is crucial, some studies have looked into the potential for conflict in the process of transformation. It has shown transformation of practice often brings consequences. The reality indicates that the economy still dominates the social and environmental aspects (Giddings et al., 2002; Mohseni et al., 2022). The sustainability concept has also been a continuous debate over decades between the weak versus strong sustainability perspective, contradicting in terms of whether economic achievement can be used as the judgement for the natural impact substitution or not (Ang & Passel, 2012; Gutés, 1996; Huang, 2018; Sulewski et al., 2018). It is highly possible that natural degradation is resulted by the chain's activities (Morone & Cottoni, 2016; Vroegindewey & Hodbod, 2018). These have been shown through various indications such as over-exploitation, deforestation, soil erosion-degradation, pollutions, and hazardous waste (FAO, 2022; Morone & Cottoni, 2016). The role of the socio-cultural impact should be further noticed because the social influence may be relevant to the economic and environment (Vroegindewey & Hodbod, 2018).

Given the risk of negative transformations, development of the sustainable value chain has been invested in significantly, particularly in developed countries, whereas many developing countries face difficulties in developing the practice. The Sustainable Development Goals (SDGs) have emerged as a long-term standard in order to aid in global sustainability practice (United Nations, 2013), however, it cannot ensure the goals suit developing countries' characteristics. In order to address this issue, some studies have advanced the discussion on enabling factors such as quality improvement (Collins, 2014; Norton, 2017), higher-value market linkage (Borsellino et al., 2020; Royer et al., 2016; Sjauw-Koen-Fa et al., 2016), governance enhancement (Gardner et al., 2019; Thorpe, 2018) and certifications (Schoneveld et al., 2019). Most of these approaches lack structure in providing the transformation mechanism. It is still unclear which factors should be

given priority and how the process is organised. Furthermore, the direction of transformation has only been partially anticipated. The main concern to be anticipated in developing countries is their priority in economic growth for poverty reduction when they service the global and higher value markets. According to FAO (2022), international trade in food and agriculture not only has the potential to hasten the depletion of natural resources, but also to hasten lifestyle changes and increase inequality for developing countries. As a result, further research in this area is critical.

1.3 Indonesia's cashew sector as a case study application

Indonesia is an archipelagic and agricultural-based developing country. Splitting by the equator line had caused a tropical climate to almost the entire country with an average temperature range between 26°-28°C and annual rain range around 2,000 – 3,000 mm. It has rainy and dry seasons enabling it to produce various types of tropical commodities. Therefore, the agricultural sector takes the primary role as food supply, GDP, rural household income and labour absorption (Ministry of Agriculture, 2015; Statistics Indonesia, 2018). Agriculture accounted for 12.62 % of the country's GDP in 2021. Around 31.86% of the entire labour force and 31% of land resources are also employed in the agricultural sector (FAO STAT, 2017).

The agricultural sector in Indonesia comprises four sub-sectors: food crop, horticulture, plantation, and livestock. These sub-sectors actively contribute to the global high-value food sector. In particular, the plantation sub-sector has contributed to most of the trade value, with an increase of approximately 15.72 percent between 2017 and 2021 as shown in Figure 1.1. The top ten commodities in Indonesia's exports in 2021 and 2022 are shown in Table 1.1, which include palm oil, rubber, coconut, sugarcane, coffee, cocoa, sago, cashew nuts clove and tea (Ministry of Agriculture of Indonesia, 2022).

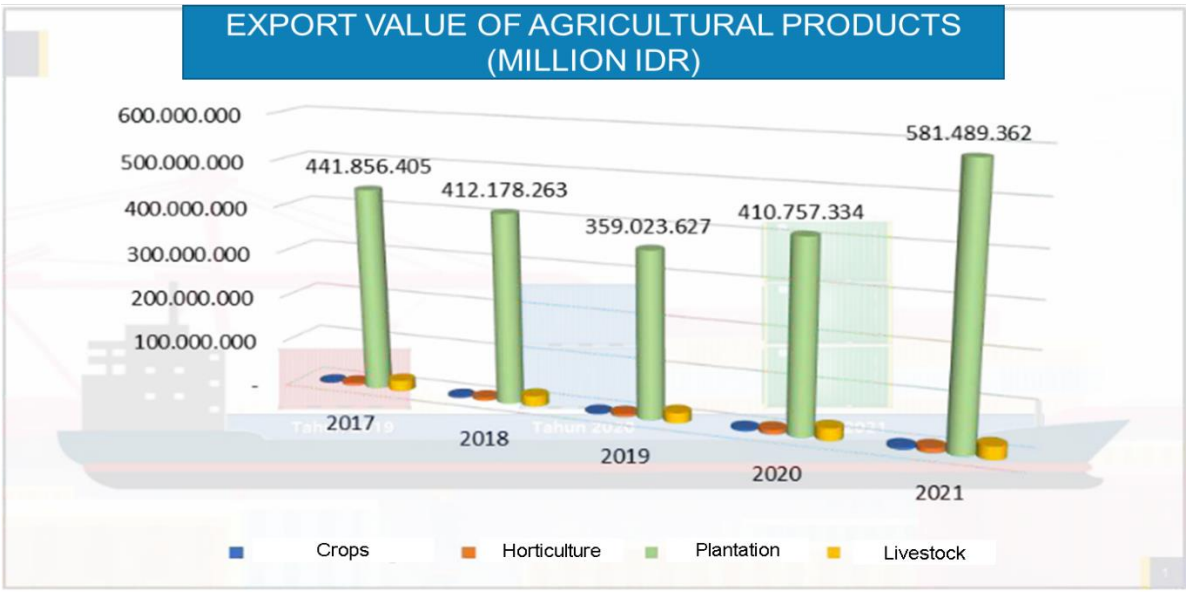


Figure 1. 1. Export value of Indonesia's agricultural products between 2017-2021
Source: Ministry of Agriculture of Indonesia (2022)

Among plantation commodities, cashew is a high value commodity in Indonesia with a high potential to reform into sustainable value chain practices. This commodity offers benefits such as volume growth, high-value advantages, and conservation benefits. The production of cashew nuts shows a positive trend from 2018-2022 with 3.76% growth, as shown in Table 1.1. For decades, exporting cashew nuts has been a steady and profitable operation with strong demand. The cashew demand in the global market is also increasing as part of the healthy food-life style benefit (Listyati & Sudjarmoko, 2011; Ministry of Agriculture, 2017). Cashew nut has high value in nutrition, great dietary fibre source, and a lowering effect on cholesterol levels for regular nut consumption (Ros, 2010; Vadivel et al., 2012).

Table 1.1. Production trend of plantation sub-sector (top ten commodities) in Indonesia from 2018-2021 (including estimation in 2022)

No	Commodity	Year (ton)					Growth (%)	Product
		2018	2019	2020	2021*	2022*		
1	Palm oil	42,883,631	47,120,247	45,741,845	46,854,457	48,235,405	3.08	CPO (Crude Palm Oil)
2	Rubber	3,630,357	3,301,405	3,037,348	3,121,542	3,135,208	-3.46	Dry rubbers
3	Coconut	2,840,148	2,839,852	2,858,010	2,853,299	2,859,515	0.17	Copra
4	Sugarcane	2,170,948	2,227,046	2,130,719	2,418,589	2,345,398	2.19	White sugar
5	Coffee	756,051	752,511	762,380	774,689	793,193	1.21	Coffee beans
6	Cocoa	767,280	734,796	720,661	706,636	732,256	-1.12	Dry beans
7	Sago	463,542	359,838	366,794	367,132	378,557	-4.31	Sago flour
8	**Cashew Nuts**	**147,647**	**162,510**	**165,868**	**170,462**	**170,662**	**3.76**	**Dry in shell nuts**
9	Clove	131,014	140,797	145,984	137,642	151,706	3.91	Dry cloves
10	Tea	140,236	129,832	144,063	145,138	146,327	1.28	Dry leaves

Source: Ministry of Agriculture of Indonesia (2022)

Cashew is commonly referred to as a "gold mine" of waste land because it is an excellent crop for soil conservation and afforestation for arid land development (Satapathy & Beura, 2020). Cashew plants can thrive in sandy soil, tolerate salinity and combat erosion of soil in coastal area (United Nations, 2021). Therefore, the cashew sector was initially established through a conservation plants program applied in Indonesia in the middle of the 1970s for dry land and sandy soil areas, and has become an economic function for the people (Ministry of Agriculture of Indonesia, 2012). Later on, Indonesia became a key cashew producer in the international market (ACi, 2010; Centre for the Promotion of Imports/CBI, 2016; Dendena & Corsi, 2014; United Nations, 2021). Figure 1.2 depicts the area where cashews are produced in Indonesia. Smallholders account for over 99 % of total cashew planting and production in the country (Directorate General of Estate Crops, Ministry of Agriculture of Indonesia, 2019; Directorate General of Plantation Indonesia, 2020).

Figure 1. 2. Distribution of cashew production in Indonesia
Source: Directorate General of Plantation Indonesia (2021)

Despite the diverse potential of cashew commodities, the best benefits have yet to be gained by Indonesia. In particular, raw cashew materials have become the focus of Indonesia's trade. Figure 1.3 shows that in 2021, approximately 90% (77,400 ton) of cashew products was traded in raw dry in-shell nuts. As a result, the country has lost its traceability as well as the ability to add value such as to produce shelled nuts or other processed products. Over 70% of raw cashew nut products are exported to the main processing countries in Vietnam and India. Based on this issue, the cashew sector was listed as one of the concerns for further development in Indonesia's Ministry Regulation number 141/Kpts/HK.150/M/2/2019. The Ministry of Trade of Indonesia (2014) added that cashew products' development, other than nuts, includes nut shells (for Cashew Nuts Shell Liquid/CNSL as renewable energy source), cashew apples (for fruit, juice, jam/alcohol, or livestock feed), leaves (for vegetables and skin herb medicine), roots (for laxative medicine), and stems (for diarrhea and colouring material). However, cashew nuts have been selected as the focus for improvement to meet the demands of both domestic and export markets in 2020-2024 (Directorate General of Plantation Indonesia, 2020). The rise in cashew consumption has created opportunities for value addition as well as diversification in cashew production (United Nations, 2021).

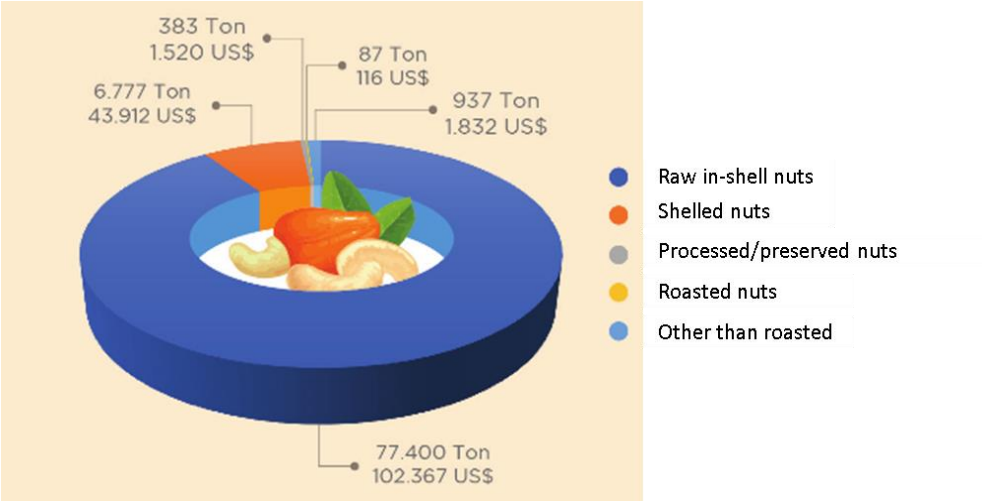


Figure 1. 3. Product of Indonesia's cashew export
Source: Directorate General of Plantation Indonesia (2021)

Indonesia needs further assistance with the cashew value chain development. The establishment of a new market of cashew in both domestic and global market with new items is still a work in progress. Indonesia has also been challenged by the global trade. Trade, which was once thought of as only economic exchange, is now a crucial tool for advancing economic, social, and environmental outcomes (FAO, 2022). Not only that, it is important for Indonesia to find markets for complex manufacturing activities which produce high value-added products (with more processed products), boost productivity, encourage product diversification, and forge solid connections between domestic large firms, small and medium-sized businesses, and domestic firms and the global markets (Asian Development Bank, 2019). In doing so, a further active role was developed by the Government in the agrifood sector trade by becoming a key partner of the OECD, which continue to foster a resilient, sustainable and inclusive recovery for the period of 2020-2025 (OECD, 2022). Indonesia was also to receive World Bank assistance for agricultural value chain development in 2022 (World Bank, 2022). Promoting sustainable agrifood value chain systems, however, might be a challenging task and may not be an easy mechanism to implement by Indonesia.

1.4 Problem statement

The transformation of agrifood value chains in developing countries towards higher value markets, while addressing sustainability concerns, poses a complex endeavour. Often, there is a lack of clarity regarding the underlying transformation mechanism. Consequently, there is an

urgent need for an applicable framework to assist with the sustainable value chain transformation in developing countries. The framework serves to unveil the mechanism required to achieve sustainable practices within the value chain, which is challenged with several issues. First, most developing countries' transformation starts from the traditional chain that featured by the traditional norm practices (Mishra & Dey, 2018). Second, there are large numbers of smallholder farmers who are excluded from value chain practice (in terms of governance and value addition), because they lack capacity, technical skills, and access to a range of support services as well as markets (McCullough et al., 2008; Reardon et al., 2019; Sjauw-Koen-Fa, 2012). Third, developing countries' agrifood sector is one of the most vulnerable sectors to deal with sustainability practices because of their economic priorities for poverty reduction. It is risky because the value establishment might exploit natural resources, causing environmental damage and a change in social-traditional norms (DFID, 2008; Sulewski et al., 2018).

In order to better understand the value chain transformation, the first question that arises is to confirm the current state of value chain practice. Agrifood value chain involves complex governance and value addition (Collins, 2014; Mishra & Dey, 2018). There are multiple actors with varying perspectives, interests, and power dynamics (Monastyrnaya et al., 2017). Several studies have found that many value chain transformations leave smallholder participants with a variety of gaps in practice, particularly in governance and value addition. Hence, transformation of practice may exacerbate their weak position and leave them with an immature practice.

To fully align with demands of higher value markets, it is crucial to assess the factors that enable sustainable value chain transformation. The imperative demand for sustainable practices in higher value markets is posing new challenges to the value chains in developing countries, particularly for smallholders. Many studies have been conducted to investigate the enablers and barriers to sustainable value chain practice in developing countries, but there is a lack of structured approach. The mechanism for prioritising actions to guide transformational change remains a daunting task. Value chain transformation potentially cause smallholders to deviate from the overall sustainability direction goals. While sustainable transformation is expected to be economically viable, socially acceptable and environmentally friendly (FAO, 2014; Sulewski et al., 2018), transformation can take either a positive or negative direction. Therefore, identification of enabling factors to transform into sustainable value chain practice should be equipped with prioritisation of action and identification of directions/vectors. This can determine whether a factor is stronger than others and whether a factor is an enabler or a barrier to transformation.

Finally, it is critical to recognise the characteristics of smallholders that are more compatible in dealing with higher value markets and the transformation of sustainable value chains. Higher value markets require integration among key actors, such as smallholders with processors and possibly the exporter (Pappa et al., 2019; Reardon et al., 2019). However, because there are large number of smallholders and they are such a diverse group, converting smallholders to sustainable value chain practices may be not an easy task. Hence, identifying compatible actor types is also critical in order to comply with higher value markets regulations and accelerate the process of sustainable value chain transformation.

1.5 Research aim and objectives

This research has investigated how to enable a sustainable agrifood value chain transformation in developing countries, and which has been achieved through the following objectives.

1. To develop a theoretical framework to enable a sustainable agrifood value chain transformation in developing countries;
2. to assess and evaluate agrifood value chain practice in developing countries;
3. to identify and analyse the enabling factors for a sustainable agrifood value chain transformation in developing countries; and
4. to assess smallholders' heterogeneity towards sustainable agrifood value chain in developing countries.

1.6 Thesis structure

This thesis consists of six chapters, written in the format of a thesis with publications. Therefore, some information may be repeated to emphasise the basis of each study and to ensure that it is in line with the key goal of the thesis. The detail structure is depicted in Figure 1.4 and described below.

Chapter one

This chapter provides background and an introduction about the research topic and the research context. The chapter includes a problem statement outlining the urgency of assisting developing countries in the sustainable agrifood value chains' transformation, research aim and objectives, as well as the description of thesis structure.

Chapter two

This chapter presents the development of a conceptual framework for a sustainable agrifood value chain transformation in developing countries. Sustainability, governance, and value addition are the three primary dimensions that have been arranged to fit the sustainable value chain concept and further explored in the context of developing countries. The framework proposed is a systematic and structural approach. The sustainability lens is integrated into the governance dimensions in order to generate value-adding activities required in the higher value markets. This chapter is formatted as a manuscript and published in the Sustainability Journal. Sustainability Journal is a peer-reviewed and open access journal, which provides a high-quality research forum on sustainability and sustainable development.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Sustainable Agrifood Value Chain—Transformation in Developing Countries. *Sustainability*, *13*(22), 12358. https://doi.org/10.3390/su132212358. https://www.mdpi.com/2071-1050/13/22/12358

Chapter three

This chapter addresses the assessment and evaluation of agrifood value chain practice in developing countries, using Indonesia's cashew sector as a case study. The maturity level of practices in value chain is evaluated in terms of governance and value addition dimension in order to identify the transformation trajectory. The paper is published in the Journal on Food and System Dynamics (IJFSD). IJFSD is a peer-reviewed journal with a well-known editorial staff from universities all over the world. It is an open access journal devoted to disseminating research on the development of food system management and its players. In addition to this, the paper was presented at New Zealand Agricultural and Resource Economic Society (NZARES) conference in September 2021.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/96/1073

Chapter four

The chapter contends with the enabling factors of sustainable agrifood value chain transformation in developing countries. The study empirically identifies and analysis the key

factors that enable sustainable value chain transformation. The investigation was based on sustainable, governance, and value addition dimensions, with an emphasis on the smallholder perspective in developing countries. The existing practice and future intentions were evaluated. The paper is published in the Journal of Cleaner Production. This is a leading journal dedicated to cleaner production, environment, and sustainability research and practice.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2023). Enabling sustainable agrifood value chain transformation in developing countries. *Journal of Cleaner Production*. Volume 395 (Available online 11 February 2023). https://doi.org/10.1016/j.jclepro.2023.136300

Chapter five

The chapter discusses how smallholders' heterogeneity is assessed with regard to a sustainable agrifood value chain in developing countries. The key objective of investigation is finding smallholders who are more in line with higher-value market demands, and then giving them priority to advance the shift to sustainable value chain practices. The smallholders are categorised based on their intention to engage in sustainable value chain practices in the future, followed by a description of their socio-economic situation and current practice. The manuscript has been published by the British Food Journal (BFJ). The BFJ is a peer- reviewed journal, where the scope covers food-related research highlighting the challenges of transitioning to sustainable food production. Additionally, this paper was presented at the the British Food Journal International Virtual Conference on "Promoting Sustainable Food Production: Challenges, Practices, Impacts, and Solutions" (30 November and 1 December 2022).

Hidayati, D. R., Garnevska, E., & Ramilan, T. (2023). Assessing smallholders' heterogeneity towards sustainable value chain in developing countries. *British Food Journal*. https://www.emerald.com/insight/content/doi/10.1108/BFJ-11-2022-0940/full/html

Chapter six

This chapter concludes and integrates the key findings in this study, outlines the limitations, and offers recommendations for future research.

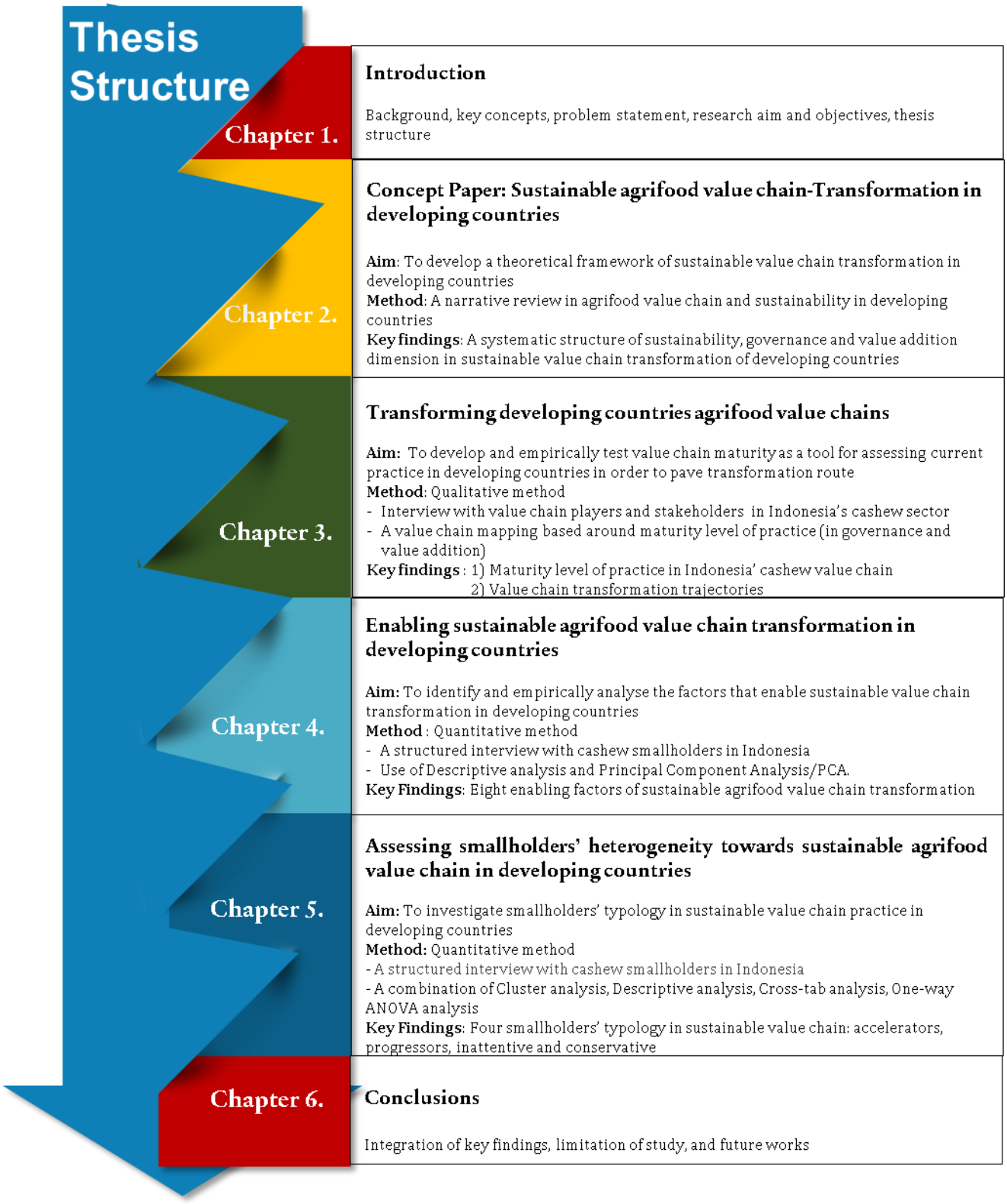


Figure 1. 4. Thesis structure

References of Chapter 1

Abraham, M., & Pingali, P. (2020). Transforming Smallholder Agriculture to Achieve the SDGs. In S. Gomez y Paloma, L. Riesgo, & K. Louhichi (Eds.), *The Role of Smallholder Farms in Food and Nutrition Security* (pp. 173–209). Springer International Publishing. https://doi.org/10.1007/978-3-030-42148-9_9

ACi. (2010). *A Value Chain Analysis of the Cashew Sector in Ghana*. Technische Zusammenarbeit GmbH (GTZ). https://agoa.info/images/documents/5130/Chashew_valuechain_analysis_Ghana.pdf

Ang, F., & Passel, S. V. A. N. (2012). Beyond the Environmentalist's Paradox and the Debate on Weak versus Strong Sustainability. *BioScience*, *62*(3), 251–259. https://doi.org/10.1525/bio.2012.62.3.6

Antoniou, P. H., Levitt, C. E., & Schreihans, C. (2012). Managing Value Chain Strategy. *Journal of Management and Marketing Research*, *9*(March), 1–11.

Asian Development Bank. (2019). *Policies to Support the Development of Indonesia's Manufacturing Sector during 2020-2024: A Joint ADB-Bappenas Report*. Asian Development Bank. https://doi.org/10.22617/TCS199910-2

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, *18*(13), 1–10. https://doi.org/10.1017/S136898001500021X

Boehlje, M. (1999). Structural Changes in The Agricultural Industries: How Do We Measure, Analyze and Understand Them? *American Journal of Agricultural Economics*, *81*(5), 1028–1041.

Bokelmann, W., & Adamseged, M. E. (2016). Contributing to a Better Understanding of The Value Chain Framework in Developing Countries. *5th International Conference of the African Association of Agricultural Economists*, 1–13.

Borsellino, V., Schimmenti, E., & El Bilali, H. (2020). Agri-Food Markets towards Sustainable Patterns. *Sustainability*, *12*(6), 2193. https://doi.org/10.3390/su12062193

Centre for the Promotion of Imports/CBI. (2016). *Exporting Cashew Nuts to Europe*. Ministry of Foreign Affairs, Netherland.

Chartered Global Management Accountant/CGMA. (2014). *Rethinking the value chain: The extended value chain*. The Chartered Institute of Management Accountants. https://www.cgma.org/content/dam/cgma/resources/reports/downloadabledocuments/the-extended-value-chain.pdf

Choudhury, D. P. (2018). *Sustainability Management: Strategies and execution for achieving responsible organizational goals*. Zorba Books.

Christopher, M. (2011). Logistics & Supply Chain Management. In *Communications of the ACM* (4th ed., Vol. 48, Issue 4). Prentice Hall. https://doi.org/10.1007/s12146-007-0019-8

Collins, R. (2014). Value Chain Management and Postharvest Handling. In *Postharvest Handling* (pp. 123–145). Elsevier. https://doi.org/10.1016/B978-0-12-408137-6.00006-5

Cucagna, M. E., & Goldsmith, P. D. (2018). Value adding in the agri-food value chain Value adding in the agri-food value chain. *International Food and Agribusiness Management Review*. https://doi.org/10.22434/IFAMR2017.0051

Dendena, B., & Corsi, S. (2014). Cashew, from seed to market: A review. *Agronomy for Sustainable Development*, *34*(4), 753–772. https://doi.org/10.1007/s13593-014-0240-7

DFID. (2008). Making Value Chains Work better for the Poor: A Toolbook for Practitioners of Value Chain Analysis. In *Journal of Economic Literature* (Issue December, pp. 1–145). Agricultural Development International. https://doi.org/10.1017/CBO9781107415324.004

Directorate General of Estate Crops, Ministry of Agriculture of Indonesia. (2019). *Tree Crop Estate Statistics of Indonesia 2018-2020: Cashew Nuts*. Ministry of Agriculture. https://drive.google.com/file/d/1Xzc92-CG7b-EfywQxKF3B9oAeb4d0oNM/view

Directorate General of Plantation Indonesia. (2020). *Strategic Plan of Directorate General of Plantation Indonesia 2020-2024.pdf*. Directorate General of Plantation Indonesia, Ministry of Agriculture. https://ditjenbun-ppid.pertanian.go.id/doc/16/RENSTRA_Ditjen%20Perkebunan%202020-2024.pdf

Directorate General of Plantation Indonesia. (2021). *Statistical of National Leading Estate Crops Commodity 2020-2022*. Ministry of Agriculture Indonesia. https://ditjenbun.pertanian.go.id/template/uploads/2022/08/STATISTIK-UNGGULAN-2020-2022.pdf

Ensign, P. C. (2001). Value Chain Analysis and Competitive Advantage. *Journal of General Management*, *27*(1), 18–42. https://doi.org/10.1177/030630700102700102

FAO. (2014). *Developing sustainable food value chains: Guiding principles*. FAO. http://www.fao.org/3/i3953e/i3953e.pdf

FAO. (2022). *The State of Agricultural Commodity Markets 2022. The geography of food and agricultural trade: Policy approaches for sustainable development*. FAO. https://doi.org/10.4060/cc0471en

Gardner, T. A., Benzie, M., Börner, J., Dawkins, E., Fick, S., Garrett, R., Godar, J., Grimard, A., Lake, S., Larsen, R. K., Mardas, N., McDermott, C. L., Meyfroidt, P., Osbeck, M., Persson, M., Sembres, T., Suavet, C., Strassburg, B., Trevisan, A., … Wolvekamp, P. (2019). Transparency and Sustainability in Global Commodity Supply Chains. *World Development*, *121*, 163–177. https://doi.org/10.1016/j.worlddev.2018.05.025

Garnevska, E., Liu, G., & Shadbolt, N. M. (2011). Factors for successful development of farmer cooperatives in Northwest China. *International Food and Agribusiness Management Review*, *14*(4), 69–84.

Gereffi, G., Humphrey, J., Kaplinsky, R., & Sturgeon, T. J. (2001). Introduction: Globalisation, Value Chains and Development. *IDS Bulletin*, *32*(3), 1–8. https://doi.org/10.1111/j.1759-5436.2001.mp32003001.x

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The Governance of Global Value Chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development*, *10*(4), 187–196. https://doi.org/10.1002/sd.199

Godfrey, R. (2016). Strategic Management: A Critical Introduction. In *Strategic management* (1st Editio). Routledge. https://doi.org/10.15216/9785406010402

Gómez, M. I., & Ricketts, K. D. (2013). Food value chain transformations in developing countries: Selected hypotheses on nutritional implications. *Food Policy*, *42*, 139–150. https://doi.org/10.1016/j.foodpol.2013.06.010

Gutés, M. C. (1996). The Concept of Weak Sustainability. *Ecological Economics*, *17*(3), 147–156.

Hanssen, G. K. (2010). Opening up software product line engineering. *Proceedings of the 2010 ICSE Workshop on Product Line Approaches in Software Engineering*, 1–7. https://doi.org/10.1145/1808937.1808938

Hansson, H., Thompson, B., Manevska, G., Toma, L., Leduc, G., & Vranken, L. (2019). *Drivers of Farmers' Up-Take of Ecological Approaches – A Conceptual Framework with a Behavioural Focus*. LIFT.

Harmon, P. (2014). Business process Change: A Business process Management Guide for Managers and Process Professionals. In *Elsevier*. Elsevier. https://doi.org/10.1016/B978-0-12-800387-9.01001-X

Hastings, K., Howieson, J., & Lawley, M. (2016). Creating Value Chains: The Role of Relationship Development. *British Food Journal*, *118*(6), 1384–1406. https://doi.org/10.1108/BFJ-10-2015-0389

Hernández, R. A., Martínez Piva, J. M., Mulder, N., & United Nations (Eds.). (2014). *Global value chains and world trade: Prospects and challenges for Latin America*. Economic Commission for Latin America and the Caribbean (ECLAC). https://www.cepal.org/en/publications/37041-global-value-chains-and-world-trade-prospects-and-challenges-latin-america

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021a). Agrifood value chain assessment in developing countries: A case of Indonesia's cashew sector. *E3S Web of Conferences*, *306*, 02045. https://doi.org/10.1051/e3sconf/202130602045

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021b). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/96/1073

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021c). Sustainable Agrifood Value Chain—Transformation in Developing Countries. *Sustainability*, *13*(22), 12358. https://doi.org/10.3390/su132212358

Huang, L. (2018). Exploring The Strengths and Limits of Strong and Weak Sustainability Indicators: A Case Study of The Assessment of China's Megacities with EF and GPI. *Sustainability (Switzerland)*, *10*(2), 1–14. https://doi.org/10.3390/su10020349

Humphrey, J. (2006). Global Value Chains in The Agrifood Sector. In *International Trade and Food Security* (Issue January 2006). https://doi.org/10.4337/9781785361890.00011

ILO/FAO/IFAD. (2010). *Agricultural Value Chain Development: Threat or Opportunity for Women's Emplyment?* (p. 4).

Janker, J., & Mann, S. (2018). Understanding the social dimension of sustainability in agriculture: A critical review of sustainability assessment tools. In *Environment, Development and Sustainability* (Issue January). https://doi.org/10.1007/s10668-018-0282-0

Kaplinsky, R., & Morris, M. (2000). A Handbook for Value Chain Research. In *Bellagio Workshop* (Issue September).

Kumar, D., & Rajeev, P. (2016). Value Chain: A Conceptual Framework. *International Journal of Information Engineering and Management Sciences*, *7*(1), 74–77.

Lee, J., Gereffi, G., & Beauvais, J. (2012). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences*, *109*(31), 12326–12331. https://doi.org/10.1073/pnas.0913714108

Listyati, D., & Sudjarmoko, B. (2011). Nilai Tambah Ekonomi Pengolahan Jambu Mete Indonesia. *RISTRI*, *2*(2), 231–238.

Manikas, I., Malindretos, G., & Moschuris, S. (2019). A Community-Based Agro-Food Hub Model for Sustainable Farming. *Sustainability*, *11*(4), 1017. https://doi.org/10.3390/su11041017

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: A case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, *21*(1), 73–88. https://doi.org/10.22434/IFAMR2017.0011

McCullough, E. B., Pingali, P. L., & Stamoulis, K. G. (2008). The Transformation of Agri-Food Systems. In *The Transformation of Agri-Food Systems*. FAO and Earthscan. https://doi.org/10.4324/9781849773331

Meybeck, A. (2016). Concluding Remarks: Sustainability in Food Value Chains: How to Get There? In A. Meybeck & S. Redfern (Eds.), *Sustainable Value Chains for Sustainable Food Systems*. Food and Agriculture Organization of the United Nations.

Strategic Plan of Ministry of Agriculture 2015—2019, Pub. L. No. 19/Permentan/HK.140/4/2015, 1 (2015). https://doi.org/10.1111/j.1469-8137.2005.01462.x

Ministry of Agriculture. (2017). *Tree crop estate statistics of Indonesia 2016 -2018: Cashew nuts*. Directorate General of Estate Crops, Ministry of Agriculture. http://ditjenbun.pertanian.go.id/?publikasi=buku-publikasi-statistik-2016-2018

Ministry of Agriculture of Indonesia. (2012). *Production, Productivity, and Quality Improvement of Annual Crops: Technical Guidance for Cashew Plants Cultivation*. Directorate General of Plantation Indonesia, Ministry of Agriculture.

Ministry of Agriculture of Indonesia. (2022). *Annual Report of Agricultural Ministry 2021* (pp. 1–170). Ministry of Agriculture, Indonesia. https://ppid.pertanian.go.id/doc/1/Laporan%20Tahunan%202021_compressed-1.pdf

Ministry of Trade of Indonesia. (2014). *Analysis for excise tax implementation at raw cashew export proposal*. Ministry of Trade of Indonesia. http://bppp.kemendag.go.id/media_content/2017/08/Analisis_Usulan_Pengenaan_Bea_Keluar_Atas_Ekspor_Mete_Gelondong.pdf

Mishra, P. K., & Dey, K. (2018). Governance of agricultural value chains: Coordination, control and safeguarding. *Journal of Rural Studies*, *64*(October), 135–147. https://doi.org/10.1016/j.jrurstud.2018.09.020

Mitchell, J., Coles, C., & Keane, J. (2009). *Trading up: How a value chain approach can benefit the rural poor* -. COPLA. https://cdn.odi.org/media/documents/5656.pdf

Mohseni, S., Baghizadeh, K., & Pahl, J. (2022). Evaluating Barriers and Drivers to Sustainable Food Supply Chains. *Mathematical Problems in Engineering*, *2022*, 1–24. https://doi.org/10.1155/2022/4486132

Monastyrnaya, E., Bris, G. Y. Le, Yannou, B., & Petit, G. (2017). A Template for Sustainable Food Value Chains. *International Food and Agribusiness Management Review*, *20*(4), 461–475. https://doi.org/10.22434/IFAMR2015.0061

Morone, P., & Cottoni, L. (2016). Transition to a sustainable agro-food system. In *Innovation Strategies in the Food Industry* (pp. 61–76). Elsevier. https://doi.org/10.1016/B978-0-12-803751-5.00004-0

Mutyasira, V. (2020). Prospects of sustainable intensification of smallholder farming systems: A farmer typology approach. *African Journal of Science, Technology, Innovation and Development*, *12*(6), 727–734. https://doi.org/10.1080/20421338.2019.1711319

Nastis, S. A., Mattas, K., & Baourakis, G. (2019). Understanding Farmers' Behavior towards Sustainable Practices and Their Perceptions of Risk. *Sustainability*, *11*(5), 1303. https://doi.org/10.3390/su11051303

Norton, R. D. (2017). Track 2 Methodology: Value Chain and Quality Criteria. In *The Competitiveness of Tropical Agriculture* (pp. 55–83). https://doi.org/10.1016/b978-0-12-805312-6.00006-4

Nutz, N., & Sievers, M. (2015). A Rough Guide to Value Chain Development: How to Create Employment and Improve Working Conditions in Targeted Sector. In *Ilo*. https://doi.org/10.6084/m9.figshare.106631

OECD. (2022). *OECD-Indonesia joint work programme 2022-2025: Fostering a resilient, sustainable and inclusive recovery*. OECD (The Organisation for Economic Co-operation

and Development). https://www.oecd.org/southeast-asia/countries/indonesia/OECD-Indonesia%20Joint%20Work%20Programme%202022-2025.pdf
Oertwig, N., Galeitzke, M., Schmieg, H.-G., Kohl, H., Jochem, R., Orth, R., & Knothe, T. (2017). Integration of Sustainability into the Corporate Strategy. In *Sustainable Manufacturing, Sustainable Production, Life Cycle Engineering and Management* (pp. 175–200). https://doi.org/10.1007/978-3-319-48514-0
Pappa, I., Illiopoulos, C., & Massouras, T. (2019). On sustainability of a dairy sector in crisis. *International Journal on Food System Dynamics*, *10*(2), 130–150. https://doi.org/10.18461/IJFSD.V10I2.08
Porter, M. E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance. In *The Free Press*.
Reardon, T., Barrett, C. B., Berdegué, J. A., & Swinnen, J. F. M. (2009). Agrifood industry transformation and small farmers in developing countries. *World Development*, *37*(11), 1717–1727. https://doi.org/10.1016/j.worlddev.2008.08.023
Reardon, T., Lu, L., & Zilberman, D. (2019). Links among innovation, food system transformation, and technology adoption, with implications for food policy: Overview of a special issue. *Food Policy*, *83*(October 2017), 285–288. https://doi.org/10.1016/j.foodpol.2017.10.003
Ros, E. (2010). Health benefits of nut consumption. *Nutrients*, *2*(7), 652–682. https://doi.org/10.3390/nu2070652
Royer, A., Bijman, J., & Bitzer, V. (2016). Linking smallholder farmers to high quality food chains: Appraising institutional arrangements. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 33–62). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_2
Satapathy, R., & Beura, S. (2020). Management of Colletotrichum gloeosporioides (Penz.) causing cashew anthracnose through bio- control agents. *Journal of Pharmacognosy and Phytochemistry*, *9*(1), 2225–2227. https://www.phytojournal.com/archives/2020/vol9issue1/PartAK/9-1-319-554.pdf
Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, *57*, 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933
Schoon, N., Seath, F., & Laura Jackson. (2013). *One Planet Living—The case for Sustainable Consumption and Production in the Post—2015*.
Sjauw-Koen-Fa, A. R. (2012). *Framework for an inclusive food strategy: Co-operatives—A Key for smallholder inclusion into value chains* (pp. 2–44). Rabobank. https://www.researchgate.net/publication/283419481_Framework_for_an_inclusive_Food_Strategy_Co-operatives_-_a_key_for_smallholder_inclusion_into_Value_Chains
Sjauw-Koen-Fa, A. R., Blok, V., & Omta, S. W. F. (2016). Critical success factors for smallholder inclusion in high value-adding supply chains by food & agribusiness multinational enterprises. *International Food and Agribusiness Management Review*, *19*(1), 83–112.
Sulewski, P., Kłoczko-Gajewska, A., & Sroka, W. (2018). Relations between agri-environmental, economic and social dimensions of farms' sustainability. *Sustainability*, *10*(12), 4629. https://doi.org/10.3390/su10124629
Thorpe, J. (2018). Procedural Justice in Value Chains Through Public–private Partnerships. *World Development*, *103*, 162–175. https://doi.org/10.1016/j.worlddev.2017.10.004
Trienekens, J. H. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review*, *14*(2), 32.

United Nations. (2013). World Economic and Social Survey 2013: Sustainable Development Challenges. In *United Nations, Department for Economic and Social Affairs*. https://doi.org/10.1016/j.urolonc.2009.06.002

United Nations. (2021). *Commodities at a Glance Special Issue on Cashew Nuts*. United Nations. https://unctad.org/webflyer/commodities-glance-special-issue-cashew-nuts

Vadivel, V., Kunyanga, C. N., & Biesalski, H. K. (2012). Health benefits of nut consumption with special reference to body weight control. *Nutrition*, *28*(11–12), 1089–1097. https://doi.org/10.1016/j.nut.2012.01.004

van Dijk, M. P., & Trienekens, J. (2012). Global Value Chains: Linking Local Producers from Developing Countries to International Markets. In *Global Value Chains: Linking Local Producers from Developing Countries to International Markets*. Amsterdam University Press. https://doi.org/10.26530/oapen_408877

Vroegindewey, R., & Hodbod, J. (2018). Resilience of agricultural value chains in developing country contexts: A framework and assessment approach. *Sustainability*, *10*(4), 1–18. https://doi.org/10.3390/su10040916

Wang, Y., & Li, Y. (2009). Formation of Value Chain Theory Jungle andIits Developing Status in China. *Asia Pacific Management Review*, *14*(3), 279–287.

WCED. (1987). *Report of the World Commission on Environment and Development: Our Common Future*. https://doi.org/10.1021/bi00694a018

Widadie, F., Bijman, J., & Trienekens, J. (2021). Value Chain Upgrading through Producer Organisations: Linking Smallholder Vegetable Farmers with Modern Retail Markets in Indonesia. *Int. J. Food System Dynamics*, *12*(1), 68–82. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/76

World Bank. (2022, September 9). *The World Bank Supports Indonesia's Agriculture Sector to Become More Resilient and Inclusive*. https://www.worldbank.org/en/news/press-release/2022/09/09/the-world-bank-supports-indonesia-agriculture-sector-to-become-more-resilient-and-inclusive

WTO. (2019). *Global value chains development report 2019. Technological innovation, supply chain trade, and workers in a globalized world*. The World Bank. https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019

WTO, & IDE. (2011). *Trade patterns and global value chains in East Asia: IDE-JETRO*. 128.

Zocca, R. O., Gaspar, P. D., da Silva, P. D., Nunes, J., & de Andrade, L. P. (2018). Introduction to sustainable food production. In *Sustainable food systems from agriculture to industry* (pp. 3–46). Elsevier. https://doi.org/10.1016/B978-0-12-811935-8.00001-9

Zokaei, K. (2010). Value Chain Analysis of the UK Food Sector. In *Delivering Performance in Food Supply Chains*. Woodhead Publishing Limited. https://doi.org/10.1533/9781845697778.3.187

Zuberi, S., Mehmood, R., & Gazdar, H. (2016). *Review of Agri-Food Value Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: Pakistan*. 49.

CHAPTER 2
Concept paper: Sustainable agrifood value chain—Transformation in developing countries

This chapter addresses a theoretical framework development for enabling a sustainable agrifood value chain transformation in developing countries. This chapter has been published in the Sustainability Journal on 9 November 2021. Sustainability Journal is a peer-reviewed, open access journal which provides a high-level forum for research on sustainability and sustainable development. It is classified as a Q1 journal (in Geography, Planning and Development) with impact factor of 3.89 in 2021 (with a 5-Year Impact Factor is 4.089 in 2021), and is indexed by Scopus, SCIE and SSCI (Web of Science), GEOBASE, etc. The paper has received five citations since it was published.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Sustainable Agrifood Value Chain—Transformation in Developing Countries. *Sustainability*, *13*(22), 12358. https://doi.org/10.3390/su132212358.

Abstract

To service high value international markets, many agrifood value chains in developing countries are required to transform to meet the strict quality and safety standards. This transformation process has become further complicated by increased sustainability expectations. The key players in these countries, typically smallholders, are struggling to meet this new sustainability value focus. Economic drivers pervade in this context, whilst the lack of integration often decouples producers from the end market. To address these challenges, this paper develops a framework to enable sustainable agrifood value chain transformation in developing countries. A narrative review was used to analyse the major enablers and barriers in sustainable agrifood value chain transformation specifically in developing countries. The framework novelty lies in the synthesis and prioritisation of transformations actions, by integrating three central dimensions: sustainability, governance, and value addition. The incorporation of sustainability drivers into

value chain governance provides a holistic approach that balances profit maximization with social and environmental impacts, thus enabling smallholders in developing countries to access higher value markets. The framework can assist these value chain actors in identifying their transformation trajectory, guide policymakers, along with the public sector, in priorities their intervention to overcome barriers.

Keywords: value chain transformation; sustainability; smallholders; agrifood; developing countries

2.1 Introduction

To increase income, many agrifood actors in developing countries are attempting to transform their value chains to access higher value markets (Hidayati et al., 2021; Reardon et al., 2019). Many of these actors are smallholder farmers, who are required to interact with multiple actors when transforming their practices to join complex high-value markets, including the global market (Gómez & Ricketts, 2013; Tomich et al., 2019). These smallholders have been compelled to increase their income by shifting their focus towards the value drivers of the final market. Downstream global players are progressively targeting supply sources from developing countries in the high value food industry (Sjauw-Koen-Fa, 2012; WTO, 2019). However, regardless of the profit opportunity, advancing smallholder practices into a high value market is an area that requires further exploration**.**

High value markets place increased expectations on food quality and safety, which contribute to the growing relevance of sustainability as a new component of "value" (Liu et al., 2019; Pappa et al., 2019). To service higher value markets, smallholder's goals are expanded from a singular profit agenda to include socially acceptable practices that also have minimal environmental impact. Transformation requires all value chain players to work towards an acceptable mutual outcome from production to consumption (DFID, 2008). Global consumers' preference have shifted into higher value, increasingly processed foods (McCullough et al., 2008) that include additional attributes to price (Adhikari et al., 2012; Collins, 2014). Wider stakeholder pressures from society, including the World Health Organization require value chain actors to embrace sustainable production and consumption as a vital component of food security (Morone & Cottoni, 2016). Therefore, the growing demand for sustainability practice further affects the transformation

process to improve not only product quality and efficiency but also social-environmental considerations that enable the business environment (Nutz & Sievers, 2015).

Smallholders face several challenges when attempting to develop sustainable value chain practices. Prior studies have concluded that smallholder farmers in developing countries are often the weakest link during transformation, as they are typically trapped in a traditional system (Hidayati et al., 2021; Thorpe, 2018). They have limited resources that constrain them from achieving high value market requirements such as low productivity, inconsistent quality, limited education, and restricted access to market information (Campos & Madureira, 2019; Mishra & Dey, 2018; Siddique et al., 2018). Many of these barriers impede value chain participation in terms of governance and value addition (Hidayati et al., 2021). For these reasons, smallholder farmers have limited power, dependent relationships, and are marginalized from more profitable markets (Thorpe, 2018).

Developing countries often undertake value chain transformation as part of a poverty alleviation strategy for smallholders (DFID, 2008; FAO, 2014; Maspaitella et al., 2018; Sjauw-Koen-Fa, 2012). Asia (i.e. Southeast Asia and South Asia) and Africa contain the highest concentration of developing countries with a significant proportion of smallholders in the agrifood value chains (IFAD, 2015; WTO, 2019). A poverty alleviation strategy often prioritises economic growth at the expense of social and environmental concerns (Schoon et al., 2013). In fact, smallholders, who generally have traditional practices, often lack the capacity to be fully engaged with the ideals of sustainability in high value markets (Pappa et al., 2019). Enhanced value adding activities by smallholders carry the potential to damage the environment and degrade social life. The agro-industrial revolution (through the development of tools, fertilizers, and planting technology) resulted in a substantial increase in land use and productivity (Zocca et al., 2018). Many of these activities have negative consequences such as overexploitation of natural resources, deforestation, and harmful waste (Morone & Cottoni, 2016).

Many studies have advanced the discussion on smallholder sustainability practice improvement in the high value markets regarding global value chains (Ingram et al., 2016; Kaplinsky & Morris, 2000). Governance enhancement (Gardner et al., 2019; Thorpe, 2018), higher value market linkage (Sjauw-Koen-Fa et al., 2016; Tray et al., 2021), and certifications (Schoneveld et al., 2019) have been proposed as approaches to advance sustainable practice in developing countries in Asia and Africa. Most of these approaches list enablers without a clear

structure, often they use a top-down lens to enable transformation, where lead firms design and dictate practices throughout the chain. As a consequence, many global players source from developing countries producers by controlling the value adding activities (Hernández et al., 2014; Hidayati et al., 2021). This prevalent practice clearly demonstrates a marginal discrepancy in sustainable value chains, which minimizes smallholders' participation in enhancement initiatives. Moreover, most of these approaches view wider stakeholders (such as the government) as external-additional functions and overlook them as critical components. Conversely, it is widely acknowledged that stakeholders strongly influence the business environment and frequently enable smallholders' practice improvement (Meybeck, 2016; Sjauw-Koen-Fa, 2012). Sustainable agrifood value chain transformation approaches have been insufficiently researched, the underlying enabling mechanisms remain unclear, and transformation trajectories have only been partially explored.

To address the aforementioned research gap, this paper aims to develop a framework for enabling sustainable agrifood value chain transformation in developing countries. The framework will assist actors to assess sustainability initiatives quantitatively and qualitatively (Petit et al., 2018). The conceptual framework development in this paper uses a narrative review method. By using this method, a broad body of literature can be synthesis under an umbrella idea (Cresswell, 2014), and thus able to support assumptions, identify research gaps, and establish integrated frameworks. A literature review, according to Snyder (2019) provides the foundation for developing a new conceptual model/theory, and it can be useful to map the evolution of a particular research subject over time. Despite the fact that the narrative method heavily relies on the researcher's interpretation, the narrative structuring generally generates a perceptible pattern (Saunders et al., 2009). This type of review can be conducted through integrative review by discussing and summarizing the current state of knowledge, noting areas of agreement and disagreements (Neuman, 2014). The literature discussion starts with the fundamentals of agrifood value chain transformation in developing countries. The following section investigates how to incorporate sustainability drivers in value chain thinking. Thereafter, the key elements that enable the transformation process (to balance the profit maximization and social environmental aspects) are synthesized into a holistic framework to operationalize the change process.

Sustainable value chain transformation in developing countries has sparked great interest in the agrifood sector recently, this paper contributes to a deeper understanding of the enabling mechanism in several ways. While previous studies focused on postulating various enablers for

sustainable value chain transformation, this paper will advance literature via the prioritisation of actions depend on value chain maturity. This study provides a structured process to assess and advance the sustainability of agrifood value chains. Further, the framework provides practitioners with information on how to enable sustainability, manage the risks of transformation, and therefore gain access to high value markets. Finally, this study will assist policymakers to provide tailored support by prioritizing interventions to address context specific barriers.

2.2 Agrifood value chain transformation in developing countries

Agrifood value chain transformation has various definitions, a classical definition by Reardon et al. (2009) described it as the process of reforming the agrifood sector through the procurement of modernized systems. The transformation of the agrifood sector has been triggered by various modernization factors such as globalization industrial structures, technology, and consumerism (Collins, 2014; Cucagna & Goldsmith, 2018). Therefore, Miller & Jones (2010) elaborated further, stating that the agrifood value chain progresses towards a modern system that delivers higher market value via increased processing and stringent quality and safety standards.

Previous studies have identified a range of value chain characteristics to evaluate agrifood transformation. Boehlje (1999) propose six co-dependent dimension; process flow, product flow, financial flow, information flow, incentive, and governance. Subsequently, many scholars have focused on the central role of governance as it drives the rest of chain's activity and determines a firm's interactions throughout the chain (Kaplinsky & Morris, 2000; Lee et al., 2012; Mishra & Dey, 2018). Governance describes market dynamics in arranging and organizing the chain's operational rules. It generally involves vertical and horizontal integration (FAO, 2014; Reardon et al., 2009), and information exchange (FAO, 2014; Sjauw-Koen-Fa et al., 2016). Governance may also include incentives and assistance such as loans, warranty, recognition programs, and financial assistance through contracts and agreements (Trienekens et al., 2018; Trienekens, 2011). Going further, Hidayati et al. (2021) argue governance activities also have a significant impact on the actual value added activities. Value addition underscores the sequential product transformation, including physical form, space, and time, with each stage potentially contributing value to the market offering (Collins, 2014; Humphrey & Memedovic, 2006; Norton, 2017).

Value chain transformation in developing countries generally starts from a traditional value chain state and progresses towards a modern domestic or modern global value chain (Gómez &

Ricketts, 2013; McCullough et al., 2008; Reardon et al., 2019). Defining transformation states and vectors provides each value chain stage with clear boundaries and future orientations. Simultaneously, it indicates how agrifood value chains can progressively become market-oriented (Saunders et al., 2016). However, market orientation may not adequately describe many immature value chain transformation processes. This is because a significant gap remains in many developing countries' value chain practices, regardless of the market requirements. According to Gereffi et al., (2005), there have been variations of governance practice used by value chain actors, despite the development of global markets. Thus, to facilitate a better understanding of agrifood value chain transformation, Hidayati et al., (2021) proposed three practice maturity levels by integrating governance and value addition attributes (Shown in Table 2.1).

Table 2. 1. Agrifood value chain transformation in developing countries

Dimension	**Value Chain Transformation**		
	Traditional	**Managed**	**Best Practice**
Governance	Limited Integrated	Formal Integration	Collaborative Integration
System	Informal, transactional	Structured, controlled	Orchestrated, aligned
Market	Local	Modern domestic	Modern global
Value Addition	Commodity based	More processing based	Branded and certified
Value	Raw	Processed	High
Quality & safety	Inconsistent	Standardised	Superior

Source: adapted from Hidayati et al., (Hidayati et al., 2021).

Maturity level evaluation facilitates an evolutionary assessment in terms of experience and practice quality (Lahti et al., 2009). Table 2.1 provides a means to assess the maturity of practice regarding governance and value addition. Once current status is determined, transformation routes can be identified to advance value chains to service high value global markets. Practice in developing countries necessitates the adoption of an integrative structure as the bases for directing the transformation process, as integration is a fundamental factor to determine the success of value chain operations (Childerhouse & Towill, 2011). The classification of integration structure to detect transformation direction aligns with Collins (2014), who highlighted value chain managerial takes progress through three key stages: traditional chain, managed chain, and best practice management.

Transforming value chains from traditional systems in developing countries is not a straightforward task that will undoubtably face numerous challenges. To addresses this, barriers need to be identified prior to transformation and potentially be exploited to create opportunities (Ingram et al., 2016). While the discussion in this area is continuously evolving, most of the studies

highlight the major barriers of value chain transformation in developing countries relate to smallholders' practice. Smallholders typically operate in a traditional mode, disjointed from advanced value chain systems (Hidayati et al., 2021; Thorpe, 2018). The main barriers to advancing smallholders' practice are associated with their characteristics, which include low productivity, inconsistent quality, high transaction costs, limited skills, and limited access to market, best practice, and financial information (FAO, 2016; Sjauw-Koen-Fa, 2012). These factors hinder the value chain integration via the disconnection of practices in terms of goal setting, planning, working cultures, and synchronization (Childerhouse & Towill, 2006). In addition to these barriers, several enablers have also been identified in the developing countries context. Table 2.2 synthesis the most pertinent barriers and enablers for agrifood value chain transformation in developing countries.

In transformational actions, setting the boundary is fundamental to clarity the enabling tasks. The key enablers and barriers of value chain transformation in developing countries are categorised into niche, meso, and macro levels in Table 2.2 By knowing which part drives the value chain transformation, the process can be managed appropriately based on the governance and facilitation requirements (Sjauw-Koen-Fa, 2012). Therefore, transformation studies in the agrifood context increasingly require a Multi-Level Perspective (MLP) to analyse transitions (El Bilali, 2018, 2019; Smith et al., 2010). Within the MLP approach, value chain transformation in developing countries focuses on smallholder's perspective as the niche level, a value chain perspective at the meso level, and stakeholder's perspective as the macro level. Despite the differences in perspectives, these levels are not opposed to each other. Rather, these perspectives complement one another in terms of providing a consistent focus to enable transformation.

As stated earlier, the first critical investigation regarding value chain transformation is the smallholders' perspectives. The information pertains to smallholders' characteristics along with their intention to participate in the transformation process (Tray et al., 2021), and their capacity to scale up operations through horizontal coordination (Heggelund, 2017; Royer et al., 2016). The attention then turns to the value chain stage perspective. Through a vertical coordination lens, the value chain perspective explores the relationship between smallholders and buyers. Due to the need to obtain consistent supply, buyers frequently combine buying processes with facilitation approaches to motivate smallholders to participate in the chain (Schneemann & Vredeveld, 2015). Finally, the last stage is to consider stakeholders' views in order to enable agrifood value chain transformation in a broader context.

Table 2. 2. Agrifood value chain transformation enablers & barriers in developing countries

Level (Stage)	Enablers & Barriers	Description	Sources
Niche (Farmers)	Collective action (i.e., farmer groups or cooperatives)	Collective action improves members' position and facilitates economies of scales (i.e., production, product aggregation, communication)	(Maspaitella et al., 2018; Royer et al., 2016; Sjauw-Koen-Fa, 2012; Sjauw-Koen-Fa et al., 2016; van Dijk & Trienekens, 2012)
	Off-farm business support	Smallholders often rely on support from alternative sources of income	(Sulewski et al., 2018)
	Access to service	Service access improves the opportunity to capture higher-value products (i.e., input, finance, technical expert, information sharing, production improvement)	(Royer et al., 2016; Sjauw-Koen-Fa, 2012; van Dijk & Trienekens, 2012; Vroegindewey & Hodbod, 2018)
Meso (Buyers) and Potentially Macro (Government/NGO)	Access to market development	Many smallholders can be reached through the facilitation of market projects (establish contract terms, negotiation capacity, collaboration, standard arrangement)	(Barrett et al., 2010; Dunn, 2014; FAO, 2016; Hidayati et al., 2021)
	Capacity enhancement (i.e., financial, technical, human resources)	The capacity enhancement offers technological transfer activities to deal with smallholders' technical constraints	(Maspaitella et al., 2018; Reardon et al., 2009; Royer et al., 2016; Thorpe, 2018)
	Incentive (i.e., input, price, risk on buying warranty)	Incentives encourage smallholder participation in higher-value markets	(Reardon et al., 2009; Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016; J. H. Trienekens, 2011)
Macro (Government)	Regulation within facilitation	Government policies and assistance to support smallholders (i.e., producer organization development, service, and market support)	(Garnevska et al., 2011; Norton, 2017; Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa, 2012)
	Infrastructure	Infrastructure impacts quality of high value food, transaction costs, and information (i.e., transportation, telecommunication, etc.)	(Reardon et al., 2019; J. H. Trienekens, 2011)
Macro (NGO)	Assistance from public sector	The public sector represents community responses and often provide assistance to meet their requirements (i.e., Networking, Capacity Building, Monitoring)	(Garnevska et al., 2011; IFAD, 2015)

Many stakeholders (such as government and NGOs) perceived agrifood value chain transformation as a strategy for reducing poverty in developing countries, which benefits global supply (Sjauw-Koen-Fa, 2012). For this reason, transformation is often seen as the agenda of stakeholders, which often involves capacity enhancement and incentives (Barrett et al., 2010; Heggelund, 2017; IFAD, 2015). While most assistances from stakeholders are advantageous, many of these have been associated as transient interventions and project based operations (Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016). Hence, despite stakeholders' interventions aimed at improving smallholders' practices (Ingram et al., 2016; Meybeck, 2016), they are often considered as an additional, somewhat external player.

2.3 Agrifood value chain sustainability

The most pressing challenge in the high value food industry is sustainable practice. Value chain actors are required to refocus on "value" from the multi functionality elements of sustainability (Liu et al., 2019). In general, Choudhury (2018) had introduced the sustainability concept as a global system that focuses on environmental, social, and economic elements, which fulfils the needs of current generations' whilst considering future generations ability to meets their needs. To respond to the urgency of sustainability in the agrifood sector, many scholars stress sustainability as a foundation for long term food security (Berry et al., 2015; Vroegindewey & Hodbod, 2018). The World Health Organization (WHO) defines food security as economic and physical access of agrifood activities that adhere to sustainable production and consumption principles (Morone & Cottoni, 2016). Aligned to this food security definition, sustainable value chains are defined in accordance with FAO (2014) (p.6):

"The full range of farms and firms and their successive coordinated value-adding activities that produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad-based benefits for society, and does not permanently deplete natural resources".

Within the scope of food security, sustainability is not simply a set of indicators. Rather, sustainability is an integrated system of dimensions (Sulewski et al., 2018). A value chain is perceived as an economic based activity that accesses both social and environmental dimensions.

The value chain combines resources such as natural capital, knowledge and skills within the social structures to deliver products or services (Oertwig et al., 2017), in which the products also end up in the environment (Giddings et al., 2002). Based on this, the dimensions of sustainable agrifood value chains are seen as a layered system. For instance, according to Giddings et al. (2002), the economic dimension exploits society and environment dimensions, and Raworth (2017), who identified the social foundation and ecological ceiling as an embedded dimension, expressed through a doughnut economy approach. A layered or nested system, on the other hand, has a tendency to prioritise certain dimension above others. Meanwhile, strong sustainability practice necessitates a more balanced interaction of practice. In other words, economy, ecology, and social dimensions are to be accounted for at each value chain stage (Idowu & Schmidpeter, 2015).

A value chain is deemed economically sustainable if each stage's activities generate value that leads to profit (FAO, 2014; Sulewski et al., 2018). Being sustainable in the social dimension refers to a value chain that is both culturally and socially acceptable. However, assessing this social dimension continues to be a daunting task (Filippi & Chapdaniel, 2020). Higher levels of comprehensiveness and stringency in the social dimension can only be achieved by addressing foundations on standards within scope (Janker & Mann, 2018), therefore, the social dimension direction should not be limited to social acceptability. Being socially engaged would strengthen connectedness and shared meanings with the community (Arai & Pedlar, 2003). The third dimension, illustrated in Figure 2.1, is the environment which refers to the actor's ability to minimize any negative environmental impacts from the value adding activities and if possible have a positive impact (FAO, 2014; Sulewski et al., 2018). To represent this practice, some scholars recommend the term 'environmentally friendly' (Hansson et al., 2019; Nastis et al., 2019). However, an environmentally respectful practice better depicts the act of practicing in a responsible way by respecting the environment (Piedra-Muñoz et al., 2016; Sulewski et al., 2018).

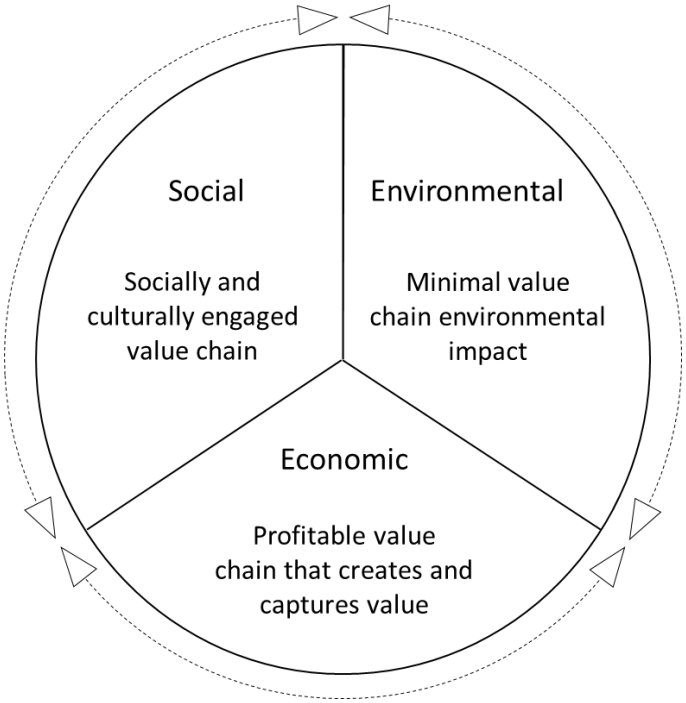


Figure 2. 1. Sustainable value chain dimensions

A fully sustainable value chain is only possible if all three dimensions are aligned. In a developing countries context, this will be the compelling goal, yet the most difficult task. Enabling synergic incorporation of sustainability into a value chain is an area under intense research but has been incompletely explored in developing countries' literature. In contrast, many sustainability studies have been broadly explored in developed countries (Mastronardi et al., 2019; Monastyrnaya et al., 2017; Petit et al., 2018). The approach for sustainable agrifood value chain transformation has been extensively viewed from various perspectives such as the individual (farm or household), local, global (sector-specific), and plot (*ex-post and ex-ante*). Despite this, some fundamental principles from developed countries may serve as the foundation for this context. For instance, incorporating sustainability into agrifood value chains begins with emphasizing farm practices (Nastis et al., 2019; United Nations, 2013). This stage plays a significant role that determines the subsequent stages' performance. Farm practices are highly reliant on environmental sources (DFID, 2008), the production of perishable goods (Norton, 2017) and supplying the basic attributes of consumer's value (Collins, 2014).

The economy dimension is prioritised in developing countries (Giddings et al., 2002; Hansson et al., 2019; Sulewski et al., 2018). Although the Economic for Common Good (ECG) perspective has also seen the rationale of using economic gain to tailor the other aspects (Raworth, 2017), economic growth that jeopardizes nature and human life is no longer deemed acceptable. Nature

is an asset priced beyond market value, and human life ultimately depends on the natural environment (Cavagnaro & Curiel, 2012). The interactions between the three dimensions can be considered as synergies, complementary, competitive, or in conflict (Galdeano-Gómez et al., 2017; Sulewski et al., 2018). To assess transformation directions, the two most contradictory routes can be consolidated as positive and negative. While the competition and conflict relationships can lead to a negative transformation, synergy and complementary relationships can help to achieve a positive transformation.

A positive economic transformation represents an improvement of profit, which can be achieved by enhanced activities such as new processes, products, or functions (Piedra-Muñoz et al., 2016), elimination of inefficient activities (Tan & Zailani, 2009), an increase of productivity (Harmon, 2014), and also an expansion of market opportunities (Idowu & Schmidpeter, 2015). A positive and meaningful social transformation benefits both value chain actors and the wider society (Pérez & Oddone, 2016; Tan & Zailani, 2009). Value chains in the agrifood sector in developing countries are characterized by the presence of a multitude of individual smallholder farmers. Individual (or within group) levels are determined by factors such as education, working conditions (Latruffe et al., 2016), farming skills, and experience (Sulewski et al., 2018). However, more accurate social dimension indicators are obtained by observing social components of specific farming systems (Janker & Mann, 2018). Meanwhile, a wider society level is often determined by employment, acceptable cultural practices, and the safety and quality of products and processes (Diazabakana et al., 2014; Latruffe et al., 2016; Lebacq et al., 2013). A positive environmental transformation results when natural resources are utilized in line with domestic and international regulations (Pérez & Oddone, 2016), waste handling (Idowu & Schmidpeter, 2015), and ecosystem protection and restoration (Choudhury, 2018).

Negative transformation is the opposite of positive transformation, value can be added or lost at each stage (FAO, 2014). Value adding often puts pressure on natural resources, resulting in environmental degradation and the eroding of social traditional norms (DFID, 2008). In the same way, social conditions through the interaction of people and nature also influence ecological sustainability (Lele, 1991). As a consequence, conflict can arise due to natural deterioration caused by a chain's activities (Morone & Cottoni, 2016; Vroegindewey & Hodbod, 2018). Long term consequences affect not only the environment but also the economic foundations, as the food industry is highly reliant on nature for the supply of raw materials (FAO, 2016). Table 2.3 incorporates sustainability into agrifood value chain by identifying the major enablers and barriers.

Amidst the variation and complexities of enablers/barriers for a sustainable practice transformation shown in Table 2.3, more exploration of enabling mechanisms is urgently needed. The underlying method to transform value chain practice in line with sustainability is still far from clear. Many of the enablers may work in tandem or different ways and be applied by various actors without a clear structure. A discussion on a systematic structure to leverage the sustainability enablers has been overlooked to date. Structuring the activities will help provide a clearer view of the mechanisms and synergize between players (Hidayati et al., 2021). It is critical to shed light on prioritizing each stage activity in order to portray the precedence of goals, while simultaneously eliminate irrelevant activities to avoid negative transformations.

Preventing detrimental transformation is the most challenging task, numerous studies have suggested the employment of sustainable value sharing as a key governance activity. Value sharing enables sustainable value inclusion into a value chain (Fearne et al., 2012; Porter & Kramer, 2006), which ultimately contributes to sustainable production and consumption (Silva & Figueiredo, 2020). The merit of sustainable value results from synergizing value chain actors (i.e. farmers and firms) in sharing their sustainability vision and willingness, through a common sustainable strategy in order to avoid conflicts (Filippi & Chapdaniel, 2020; Monastyrnaya et al., 2017; Silva & Figueiredo, 2020). Value sharing requires further exploration to accurately capture the needs of developing countries' practice. Value sharing that exclusively focuses on value chain actors may limit the sustainability scope and overlook the critical role of wider stakeholders. Sharing activities in developing countries should address not only internal value chain actors but also external actors (Idowu & Schmidpeter, 2015). In the meantime, the use of the term ‘external actor’ for the government tends to disconnect its important function in affecting the business environments (SDSN, 2013). Government and or NGOs play critical roles in determining value chain guidelines, as part of the governance dimension (van Dijk & Trienekens, 2012). Sustainable value creation is an ideal target, where all three sustainability dimensions are considered concurrently resulting in a commitment to delivering ecological, societal, and economical value addition (Idowu & Schmidpeter, 2015).

Table 2. 3. Key enablers and barriers to incorporate sustainability into agrifood value chains

Element	Positive (Enablers)	Source	Negative (Barriers)	Source
Plan	The plan leads to sustainability practice in terms of long-term survival within changing contexts (i.e., input, price, productivity, regulation, market demand).	(Latruffe et al., 2016; Nastis et al., 2019)	No available plan or orientation will make farmers (and other VC actors) difficult to recognize and adjust any sustainability requirement.	(Latruffe et al., 2016; Nastis et al., 2019)
Information Quality	Well defined value addition and sharing (such as products' specification, logistics, and price) would encourage farmers to capture more sustainable value.	(El Bilali & Allahyari, 2018; Filippi & Chapdaniel, 2020; Hastings et al., 2016)	Poor information quality will leave farmers unaware of sustainability specification (either product or practices).	(El Bilali & Allahyari, 2018; Hastings et al., 2016; Hidayati et al., 2021; Pretty, 2008)
Effective communication	Effective communication information (in delivery, collecting, accessing, and digital tool use) between farmers and buyers would improve sustainability practice.	(Boehlje, 1999; Gardner et al., 2019; Hansson et al., 2019; Mangla et al., 2018; Seidel-Sterzik et al., 2018; Sulewski et al., 2018)	An ineffective communication method (asymmetrical sharing) results in poor and delayed decisions.	(Gardner et al., 2019; Mangla et al., 2018; Seidel-Sterzik et al., 2018)
Incentives	Incentives (i.e., financial, subsidies, tools, and price) stimulate farmers to adopt and create sustainable value.	(Borsellino et al., 2020; Hansson et al., 2019; Jaffee & Henson, 2005; Mangla et al., 2018)	Lack of incentives hinders farmers' motivation to practice sustainability.	(FAO, 2016; Larsen, 2016; Zocca et al., 2018)
Sustainable market	Access to the sustainable market would encourage VC actors (especially smallholders) to practice sustainability.	(Borsellino et al., 2020; Grwambi et al., 2016)	Lack of access to sustainable markets hinder smallholder farmers' sustainable practice.	(Borsellino et al., 2020; Grwambi et al., 2016; Larsen, 2016)
Behavior	The socio demography (i.e., farm structure, behaviour, self-identity, and motivation) motivate farmers to adopt an ecological practice.	(Hansson et al., 2019; Nastis et al., 2019)	The socio demography (i.e., poor in farm structure, behaviour, self-identity, and motivation) affect farmers to adopt an ecological practice.	(Hansson et al., 2019; Nastis et al., 2019)

Government role	Regulation may provide fundamental tasks and pressure on sustainability adoption.	(FAO, 2014; Mangla et al., 2018; Morone & Cottoni, 2016; Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016)	Indifferent regulation hinders the sustainability implementation by smallholder farmer.	(FAO, 2014; Mangla et al., 2018; Morone & Cottoni, 2016; Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016)
Facilitation	Facilitation from the private or public sector will escalate sustainability concerns and practice.	(Chofreh et al., 2019; Hansen et al., 2018; Ingram et al., 2016; Lindgreen et al., 2013; Oertwig et al., 2017)	Less facilitation will hinder the sustainability implementation by smallholder farmers.	(Chofreh et al., 2019; DFID, 2008; Lindgreen et al., 2013; Porter & Kramer, 2006)
Certification	Certification (i.e., GAP) helps to satisfy sustainable market requirements, create transparency, and guide smallholders to integrate into a high value market.	(FAO, 2014; Humphrey & Memedovic, 2006; Papadopoulos et al., 2019; Schoneveld et al., 2019)	Lack of certification degrades trust and evidence of sustainable practices, which hinders high value market expansion.	(FAO, 2014; Humphrey & Memedovic, 2006; Papadopoulos et al., 2019; Schoneveld et al., 2019)

2.4 Sustainability and agrifood value chain transformation in developing countries

Enabling sustainable agrifood value chain transformation is a burgeoning research area which is relatively underexplored in a developing countries context. Various approaches are often used to address the increased focus on sustainability in agrifood value chain transformation via a combination of variables as enablers. However, the persistent challenge in this area primarily lies in the enabling mechanism. In particular, how to manifest in a myriad of specific practices for smallholder actors of developing countries and convert their orientation towards sustainability requires addressing. Therefore, to advance the current state of knowledge, this paper synthesizes approaches of agrifood value chain transformation and sustainability. An organised and aligned structure of actions is indispensable to transform a value chain in developing countries (Hidayati et al., 2021). The solution offered herein synthesizes three key constructs: sustainability, governance, and value addition, as shown in Figure 2.2. Incorporating sustainability orientation into value chain governance leads to an enhancement of value addition activities, resulting in a sustainable value chain.

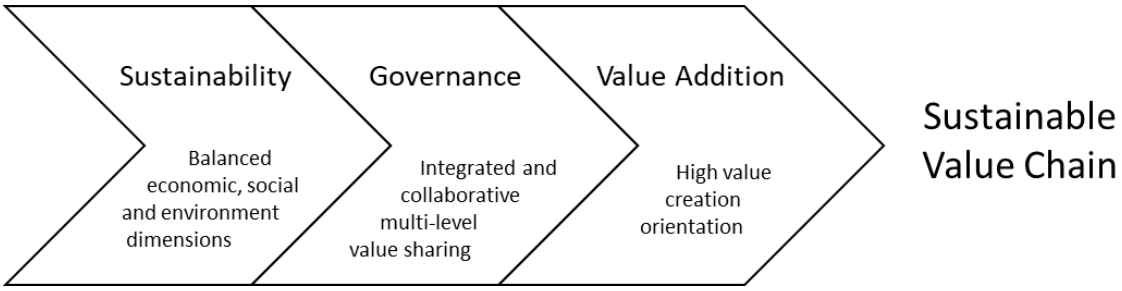


Figure 2. 2. Sustainable agrifood value chain transformation drivers

The sustainability element draws attention to prior literature that highlighted economic priorities in developing countries. This issue raises concern to balance the economic profit orientation with more social and environmental aspects to achieve sustainable practice. Being economically profitable is the first and primary orientation of smallholders in developing countries. Literature highlights that in order to create a profit, the enhancement activities contain productivity increase, cost efficiency, premium pricing, and market opportunity (Idowu & Schmidpeter, 2015; Piedra-Muñoz et al., 2016; Tan & Zailani, 2009).

Being socially engaged is the next important orientation to be embedded in developing countries. This dimension first considers the link between work and life quality (Janker & Mann,

2018). After making a profit from farm work, smallholders would generally enhance their individual well-being via education/knowledge, skill, lifestyle, and working conditions. Meanwhile, simultaneously, literature also suggests smallholders consider activities that have an impact on a wider society (Diazabakana et al., 2014; Latruffe et al., 2016; Lebacq et al., 2013). Smallholders' consideration for broader societal requirements is primarily concerned with product safety and quality, employment issues, and acceptable cultural practice.

Operating environmentally respectful practices are the last critical and most important orientation that completes the overall sustainability in developing countries. The most fundamental aspect of environmental orientation relates to natural resource management, waste handling, and preservation. It is also important to mention that the key actors in the production of raw commodity are farmers, who thus ultimately determine environmental sustainability (Galdeano-Gómez et al., 2017). Hence, transformation must focus on the needs of developing technologies and practices that have minimal adverse environmental effects, which are accessible and effective for farmers while also improving productivity (Pretty, 2008). Galdeano-Gómez et al. (2017) further stated that reducing pressures on natural resources link positively to economic and social elements. Another way to see this is that a long term economic condition can be achieved at the cost of not only social considerations but also environmental pressures (Sulewski et al., 2018).

The governance dimension refers to the degree of multi-level value sharing in order to capture a comprehensive sustainable perspective that suits the developing countries' context. Value-sharing starts at the smallholder stage (as a niche level) to establish the scope of the practices and motivation to transform. This level represents smallholders' typology in producing the basic value at the farm stage. Smallholders generally have a heterogeneous typology (Schoneveld et al., 2019). Therefore, farmers' demography (within farm characteristics) frequently influences their decision to join higher value markets (Tray et al., 2021). Next, smallholders also need to scale up operations in order to transform into a higher value market. To do so, they can develop horizontal coordination by collectively acting as producer organizations (PO) (Maspaitella et al., 2018; Norton, 2017; Royer et al., 2016; Sjauw-Koen-Fa et al., 2016). Collective action not only strengthens the members' positions as smallholders, but also opens up new opportunities to capture more of the value from high value markets, and improve access to both markets and services (Garnevska et al., 2011; Heggelund, 2017; Royer et al., 2016; Sjauw-Koen-Fa et al., 2016).

In order to further advance activities, value sharing progresses to the wider value chain domain (as meso level). This level highlights the activities between smallholders with key buyers in the chain, who play a significant role in sourcing from smallholders (Hidayati et al., 2021). The relationships between farmers and buyers generally comprise transaction terms, negotiation, collaboration, and standard arrangements (Collins, 2014; Hidayati et al., 2021). This type of vertical coordination also often includes a sourcing strategy applied by buyers to enable smallholder farmers to produce commodities that are compatible with high value adding chains (Sjauw-Koen-Fa et al., 2016).

In line with the preceding literature review, sustainable value chains in the developing countries context need to advance the value sharing activities by incorporating stakeholders as key governance actors. Value sharing is complete once stakeholders are included (as macro level). Stakeholders enable value sharing expansion to broader actors, who can become business influencers. For ease of interpretation, stakeholders are commonly classified according to their motivations. Most governmental actions are identified as being relevant to policy setting within program implementation (Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016). Meanwhile, the public sector is often viewed to be concerned with non-profit activities conducted by NGOs and aid organisations (Sjauw-Koen-Fa, 2012). Despite the difference in motivation, many of these institutions undertake similar actions to facilitate the advancement of smallholders' activities. Typically capacity enhancement programs are most relevant to harvesting techniques, storage facilities, and financial skills (FAO, 2016). Meanwhile, incentives are commonly interpreted as input, price, and risk related elements (Reardon et al., 2009).

The value addition dimension in developing countries has generally denoted orientation to create potential value that includes: Commodity based orientation, which indicates smallholder's focus to produce and sell raw material products with minimal treatment; Processed based orientation indicates an expansion in value adding by smallholders via post-harvesting treatments; Branded/certified orientation, which indicates smallholders' orientation in optimizing value creation through branded and certified products.

In addition to ensuring the clarity of enabling mechanism, the direction of the dimensions should be aligned. The alignment of direction will be necessarily constructed progressiveness towards each dimension's goals. A more progressive direction in each dimension increases the

possibility to achieve a sustainable value chain status (Seidel-Sterzik et al., 2018), and vice versa. Thus, progression and regression can represent the alignment of sustainable value chain transformation.

The last alignment includes enablers and barriers, which are synthesized in Table 2.4. The integration of both approaches has generated four key enablers/barriers for sustainable value chain transformation. The literature contains many similarities between approaches, such as the demography within the typology of practices, information sharing, access of market and service, and facilitation. Meantime, there are horizontal coordination and certification elements, which symbolize the uniqueness of each approach. Agrifood value chain transformation approach emphasises the fundamental role of collective action, as smallholder actors are the major stumbling block (Royer et al., 2016; Tray et al., 2021). Whereas certification is the ultimate goal that verifies sustainability practices (Papadopoulos et al., 2019; Schoneveld et al., 2019).

Table 2. 4. Sustainable agrifood value chain transformation enablers/barriers in developing countries

Agrifood Value Chain Transformation	**Enablers/Barriers**	**Sustainability**
Characteristics	Demographic Typology	Behaviour
Collective Action	Horizontal Coordination	
Information Sharing Access to market development Access to market service	Vertical Coordination a. Information sharing (information quality) b. Access (market & service)	Information quality Effective communication Sustainable market
Incentives Capacity Enhancement Regulation within Facilitation Assistance from Public Sector	Facilitation a. Incentives b. Advancement Practice Assistance c. Certification	Incentives Capacity Enhancement Government Role Facilitation (public/private) Certifications

Now the enablers/barriers are identified, the next stage is to identify who is best placed to drive the transformation. To do so, connecting enablers/barriers with the governance dimension clarities the enabling mechanism in the sustainable value chain transformation. As illustrated in Figure 2.3, this starts with the smallholders, progresses into the value chain level, and concludes with stakeholder facilitation. The smallholder level covers the enabling tasks in regard to demography within the typology of farm stage practices. As smallholders' conditions are generally heterogeneous, they may necessitate group specific support (Schoneveld et al., 2019). Meanwhile,

the typology of practice encompasses their behaviour and initiatives to better participate and effectively distribute the value to subsequent stages. In addition to this, their initiative in connecting and obtaining resources with other smallholders is vital to scale up operations. Next, the value chain level focuses on vertical integration, which orchestrates information sharing along the chain and provides access and services to end markets. At this level, buyers' involvement is critical to enhancing smallholders' capacity for meeting the sourcing requirements. Finally, stakeholders facilitate the smallholders' transformation via incentives, practice advancement support, and certification.

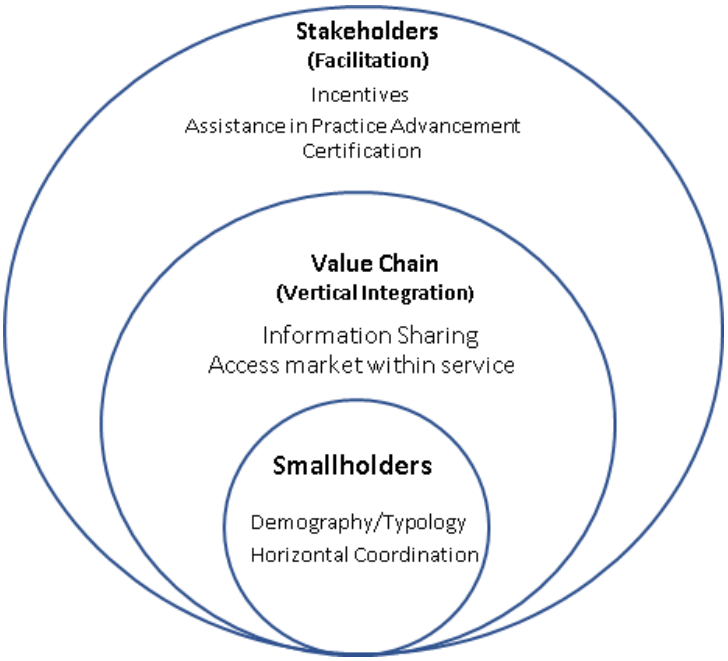


Figure 2. 3. Sustainable value chain transformation governance

2.5 Sustainable agrifood value chain transformation operationalization

Agrifood value chains in developing countries are aspiring to higher value markets and urgently need assistance to transform value chain practices sustainably. Smallholders are the 'transformation agent' in developing countries because they hold the majority role as produce suppliers and are responsible for the base value for any subsequent value chain stages. However, smallholders are the weakest actor in the value chain and are primarily focuses on economic gains. Consequently, value chain transformation carries a high risk as smallholder practices may conflict with social and environmental sustainability. A narrow short term economic focus degrades the basic value produced at the farm stage, which further hinders full participation in the higher value markets (Lindgreen et al., 2013; Schoon et al., 2013). Many social and environmental issues are under the

care of government and NGOs as key agrifood value chain stakeholders (Meybeck, 2016; Sjauw-Koen-Fa, 2012). Therefore, sustainability value has pressured the expansion of the transformational approach from 'the business as usual' in the value chain operation towards a holistic agenda.

The central contribution of this paper is the development of a framework to enable sustainable value chain transformation in the developing countries context. While previous research have focused on unearthing various enablers and barriers e.g. (Borsellino et al., 2020; Mangla et al., 2018; Monastyrnaya et al., 2017), this paper focuses on the enabling mechanism of these factors in order to gain greater clarity on how to find effective transformation trajectories. Building on the preceding synthesis of literature, the development of the mechanism constitutes the structuring of the transformation process based around three major dimensions (sustainability, governance, and value addition) and transformation direction (progression or regression). Figure 2.4 integrates the three dimensions transformation states.

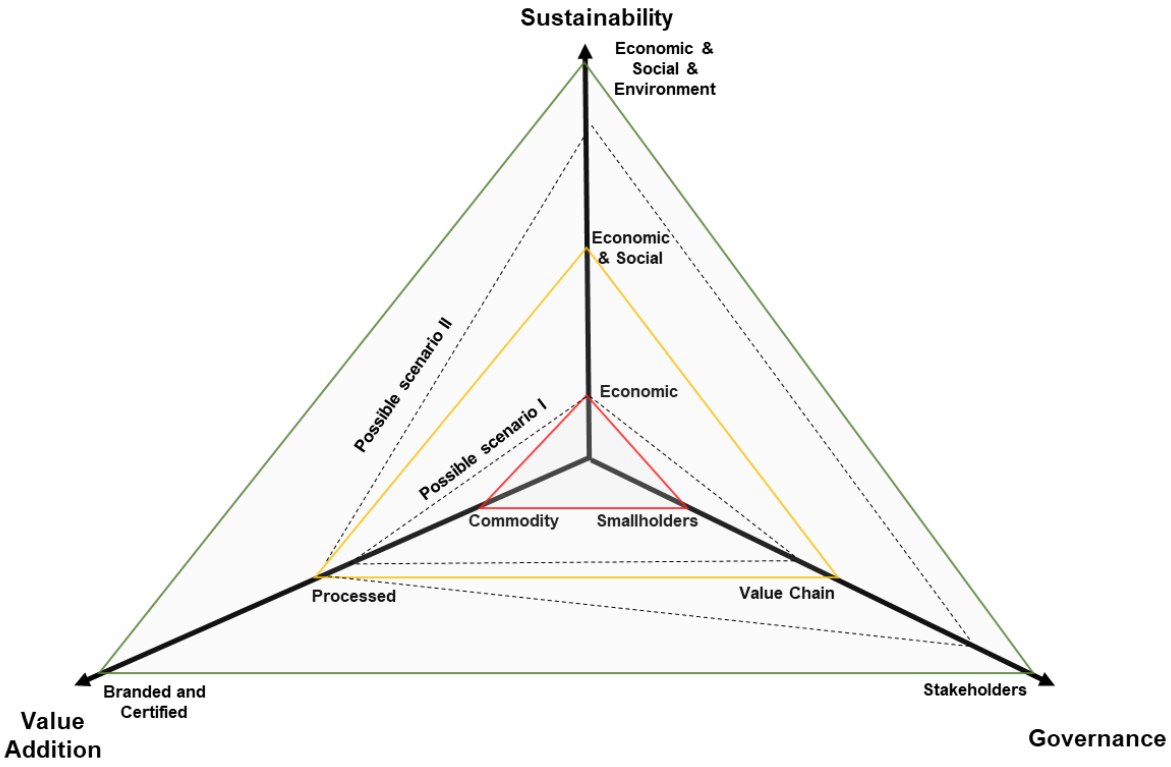


Figure 2. 4. Sustainable value chain transformation framework for developing countries

The trajectories reflect the sequential practice (in terms of sustainability, governance, and value addition) to transform into a sustainable value chain in the developing countries context. Generally, the current state of sustainable value chain practice in developing countries is assumed as

smallholder centric, with a restricted focus on pursuing their individual profitability resulting in being trapped as a commodity seller, as illustrated in the central red zone in Figure 2.4. Red is used to indicate this inner zone as a warning, with the lowest level of value chain sustainability. This traditional value chain state should be first transitioned into the yellow zone. Thereafter, to develop a sustainable value chain, the activities need to be shifted gradually into the green zone of Figure 2.4.

There is a high probability that transformation will not follow a linear stepwise path. Smallholders, for example, may have shifted their practice orientation towards a value chain perspective due to the influence of buyers, by performing more processing (shown in Figure 2.4 as possible scenario I). However, it is more than likely that they may continue to be driven by economic profit, putting social and environmental aspects at risk. In scenario II, smallholders, supported from buyers at the value chain stage and the government/NGO at stakeholders' stage, expand their consideration towards social and environmental aspects. They might also move into more processing activities, if they are not interested in pursuing the branded and certified products, they will lose out on potential higher value markets.

To help pave the transformation path, sustainability orientation is incorporating into governance, which leads to value adding activities required in a high value market. Incorporating sustainability dimension into the value chain practice is fundamental, by advancing the economic profit orientation towards a more socially engaged and environmentally respectful practice. To accomplish this, the sustainability dimension should be embedded via the governance dimension, with the smallholder level serving as the key initial stage in the value chain. Smallholders should progress their orientation from the farm stage towards the value chain stage, and ultimately level up their orientation towards wider stakeholders. The use of a multi perspective approach is critical to appreciate the dynamics of the agrifood chain at the different scales in regards to power and the interplay of relationships (Rossi et al., 2019). By doing so, smallholders are expected to progress their value adding activities from purely commodity based to processed based, and eventually achieve the branded high value certification. In short, progressive advancement of smallholders' practice in each dimension acts as a gateway in transforming the value chain into enhanced sustainability. As a practical guide, we can position the axis of any future transformation direction by using the detail indicators in Table 2.5.

Providing a practical assessment will benefit both individual players and industries to independently evaluate their position and prioritise their transformation. Using the indicators in Table 2.5, each player can perform a detailed evaluation of their enablers and barriers. Once value chain players are aware of their enablers and barriers (Meybeck, 2016), they can develop their unique plan and find the most effective transformation route. This will assist value chain actors to respond and engage with the high value market requirements. On a larger scale, industries could examine the common issues in their value chains and collectively rectify unsatisfactory and substandard practices. Overall, the development of enabling mechanisms constitutes a powerful framework to guide developing countries' players in attaining sustainability practice, managing the transformation risks, and building strong connection with the high value market.

Policymakers can also use the framework to evaluate specific agrifood sectors and prioritise tailored assistance activities. Facilitation to smallholders is generally offered in various forms, such as capacity enhancement (in the form of training) and incentives (i.e., input subsidy, tool, financial support), could be further prioritised based on the urgency of each transformation case. Stakeholders need to stringently 'hit the right button' to intervene in smallholders' actions in order to provide efficacious assistance. For this reason, facilitation should ultimately lead to certification. Although certification might seem a long term goal in many developing countries (Royer et al., 2016; Schoneveld et al., 2019), certification can create a tremendous difference on practice. Certification is very empowering for smallholders to securely participate in higher value markets. Subsequently, stakeholder can take control through policies or regulations to make positive changes (FAO, 2014).

Table 2. 5. Operationalisation of sustainable agrifood value chain transformation in developing countries

Dimension	Transformation		
	Economically Profitable	**Socially Engaged**	**Environmentally Respectful**
Sustainability	**1. Enhanced product & process** **2. Efficient costs** **3. Price increase** **4. Market expansion**	**1. Individual wellbeing:** improvement of education, experience/skill, lifestyle, and working condition **2. Wide society:** increase of employment, engaged with cultural practice, safe product, and process	**1. Input management** **2. Waste handling** **3. Preservation**
	Smallholders (Niche Level)	**Value Chain (Meso Level)**	**Stakeholders (Macro Level)**
Governance	**1. Demography and typology of practice** **a. Demography**: gender, age, family member, education, experience, farm size, plants, production **b. Typology**: input arrangement, farm cultivation, harvesting & labour using **2. Horizontal Coordination**: farmer group membership, activities in farmer group (service for input, subsidy, credit, marketing, information)	**1. Information communication** **a. Information quality**: products specification, logistic and price **b. Effective methods**: digital tool and reliable informant **2. Access and service to market development**: transaction term, negotiation, collaboration, standard arrangement)	**Facilitation**: **a. Capacity enhancement**: training **b. Incentives/Support**: input and tool subsidy, credit, financial support, market connection and expert sharing **c. Certification**
Value Addition	**Commodity Based** Raw material with minimal treatment	**Increased Processing** Post-harvest treatments	**Brand Certified** Branded and certified product

The framework in this paper complements and advances the existing value chains frameworks. For instance, the DFID framework (DFID, 2008) aims to integrate the poor (including smallholders and traditional practices) into value chains using three tools: a general tool (value chain analysis and mapping value chain), a qualitative tool (governance, linkages-relationship-trusts, and upgrading demand), and a quantitative tool (margin, income and employment distribution). While each tool provides detailed, practical, and informative analysis, it falls short in delivering a holistic and interconnected value chain view. Furthermore, the sustainability agenda is not explicitly expressed in these three tools.

In 2014, FAO (2014) developed a sustainable value chain framework using vertical coordination (governance), broad commodities scope importance, and value added along with sustainability. In 2016, FAO (2016) places more emphasis on developing countries and focuses on three main strategies: equity aspects, smallholders' linkage, and policy along with public investment foundation. The framework developed herein advances the FAO approach by operationalising the actions required to advance and via the provision of transformation pathways.

To sum up, the framework represents transformational trajectories that involve a complex interaction between three primary sustainable value chain dimensions. Prioritization on one dimension at the neglect of the other two will detract from the overall achievement of sustainable value chain transformation. This framework represents the enabling mechanism, where the value given to the society takes wider environmental impacts into account (FAO, 2014).

2.6 Conclusion

This paper highlights the adversity developing countries' value chains face when transforming to service higher value markets, given additional sustainability imperatives. The sustainable value chain transformation framework developed in this paper goes beyond previous works by synthesising governance, value addition and sustainability. The framework goes one step further by stressing the need for a distinctive approach to overcoming the major problem in developing countries' transformation: the dominance of powerless actors (smallholders) and their economic orientation.

Theoretical and technical contributions are provided by the synthesised framework. Theoretically, the enabling mechanism for a sustainable value chain transformation approach are structured regarding three dimensions along with transformation trajectories. A systematic transformation approach allows developing countries' value chains to optimally arrange actions and create effective routes for a positive transformation. Technically, the development of a practical guide in this paper assists both practitioners and policymakers to investigate transformation status and improvement trajectories. The guidelines enable practitioners to assess and self-determine their transformation path to fully align with higher value market requirements. Correspondingly, the guidelines assist policymakers in terms of delivering efficacious support for the transformation process, by prioritizing and placing their interventions to address specific barriers.

To verify the framework and progress the investigation, empirical tests are proposed in the agrifood sector of developing country. The empirical testing set for this framework will necessarily focus on high value food produced mainly by smallholders and traded on the global market. This setting would help to depict the inevitable sustainable value chain transformation, which is currently the concern of the global agrifood industry. This paper focuses on the transformation mechanism that emphasizes the positive and negative directions. These vectors and orientations require broader investigation, as trade-offs between activities on each dimension are empirically explored. Tradeoffs sometimes are needed between the degree and rate for the sustainability achievement through *vis-a-vis* objectives (Lele, 1991). For instance, it would be crucial to specifically distinguish the relationship between complementary, synergy, competition, and conflicts (Sulewski et al., 2018; Vroegindewey & Hodbod, 2018). Thus, future exploration on each element's impacts between dimensions would be beneficial to verify sustainable value chain transformation mechanisms.

References of Chapter 2

Adhikari, R. P., Collins, R., & Sun, X. (2012). *Segmenting Consumers to Inform Agrifood Value Chain Development in Nepal*. *15*(4), 93–114.

Arai, S., & Pedlar, A. (2003). Moving beyond individualism in leisure theory: A critical analysis of concepts of community and social engagement. *Leisure Studies*, *22*(3), 185–202. https://doi.org/10.1080/026143603200075489

Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H. C., Narayanan, S., & Walker, T. F. (2010). Smallholder Participation in Agricultural Value Chains: Comparative Evidence from Three Continents. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1733942

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, *18*(13), 2293–2302. https://doi.org/10.1017/S136898001500021X

Boehlje, M. (1999). Structural changes in the agricultural industries: How do we measure, analyze and understand them? *American Journal of Agricultural Economics*, *81*(5), 1028–1041. https://doi.org/10.2307/1244080Citations: 93

Borsellino, V., Schimmenti, E., & El Bilali, H. (2020). Agri-Food Markets towards Sustainable Patterns. *Sustainability*, *12*(6), 2193. https://doi.org/10.3390/su12062193

Campos, S., & Madureira, L. (2019). *Can Healthier Food Demand be Linked to Farming Systems' Sustainability? The Case of the Mediterranean Diet*. *10*(3), 262–277.

Cavagnaro, E., & Curiel, G. (2012). The Three Levels of Sustainability. In *The Three Levels of Sustainability*. Greenleaf Publishing Limited. https://doi.org/10.4324/9781351277969

Childerhouse, P., & Towill, D. R. (2006). Enabling Seamless Market-Orientated Supply Chains. *Int. J. Logistics Systems and Management*, *2*(4), 357–370.

Childerhouse, P., & Towill, D. R. (2011). Arcs of supply chain integration. *International Journal of Production Research*, *49*(24), 7441–7468. https://doi.org/10.1080/00207543.2010.524259

Chofreh, A. G., Goni, F. A., Zeinalnezhad, M., Navidar, S., Shayestehzadeh, H., & Klemeš, J. J. (2019). Value Chain Mapping of The Water and Sewage Treatment to Contribute to Sustainability. *Journal of Environmental Management*, *239*, 38–47. https://doi.org/10.1016/j.jenvman.2019.03.023

Choudhury, D. P. (2018). *Sustainability Management: Strategies and Execution for Achieving Responsible Organizational Goal*. Zorba Books.

Collins, R. (2014). Value Chain Management and Postharvest Handling. In *Postharvest Handling* (pp. 123–145). Elsevier. https://doi.org/10.1016/B978-0-12-408137-6.00006-5

Cresswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed). SAGE Publications, Inc.

Cucagna, M. E., & Goldsmith, P. D. (2018). Value adding in the agri-food value chain. *International Food and Agribusiness Management Review*, *21*(3), 293–316. https://doi.org/10.22434/IFAMR2017.0051

DFID. (2008). *Making value chains work better for the poor: A toolbook for practitioners of value chain analysis*. Agricultural Development International. https://doi.org/10.1017/CBO9781107415324.004

Diazabakana, A., Latruffe, L., Bockstaller, C., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2014). *A review of Farm Level Indicators of Sustainability with a Focus on CAP and FADN* (p. 101).

Dunn, E. (2014). *Smallholders and Inclusive Growth in Agricultural Value Chains* (Fieled Report No. 18). The United States Agency for International Development (USAID). http://www.fao.org/sustainable-food-value-chains/library/details/en/c/263629/

El Bilali, H. (2018). Transition Heuristic Frameworks in Research on Agro-Food Sustainability Transitions. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-018-0290-0

El Bilali, H. (2019). The Multi-Level Perspective in Research on Sustainability Transitions in Agriculture and Food Systems: A Systematic Review. *Agriculture*, *9*(4), 74. https://doi.org/10.3390/agriculture9040074

El Bilali, H., & Allahyari, M. S. (2018). Transition Towards Sustainability in Agriculture and Food Systems: Role of Information and Communication Technologies. *Information Processing in Agriculture*, *5*(4), 456–464. https://doi.org/10.1016/j.inpa.2018.06.006

FAO. (2014). *Developing sustainable food value chains: Guiding principles*. FAO. http://www.fao.org/3/i3953e/i3953e.pdf

FAO. (2016). Agrifood Market and Value Chains. In *Rural Development Report* (pp. 226–246). https://www.ifad.org/documents/30600024/30604603/chapter_6.pdf/8f07f4f9-6a91-496a-89c1-d1b120f8de8b

Fearne, A., Garcia Martinez, M., & Dent, B. (2012). Dimensions of sustainable value chains: Implications for value chain analysis. *Supply Chain Management: An International Journal*, *17*(6), 575–581. https://doi.org/10.1108/13598541211269193

Filippi, M., & Chapdaniel, A. (2020). Sustainable demand-supply chain: An innovative approach for improving sustainability in agrifood chains. *International Food and Agribusiness Management Review*, 1–16. https://doi.org/10.22434/IFAMR2019.0195

Galdeano-Gómez, E., Aznar-Sánchez, J. A., Pérez-Mesa, J. C., & Piedra-Muñoz, L. (2017). Exploring Synergies Among Agricultural Sustainability Dimensions.pdf. *Ecological Economics*, *140*. http://dx.doi.org/10.1016/j.ecolecon.2017.05.001

Gardner, T. A., Benzie, M., Börner, J., Dawkins, E., Fick, S., Garrett, R., Godar, J., Grimard, A., Lake, S., Larsen, R. K., Mardas, N., McDermott, C. L., Meyfroidt, P., Osbeck, M., Persson, M., Sembres, T., Suavet, C., Strassburg, B., Trevisan, A., … Wolvekamp, P. (2019). Transparency and Sustainability in Global Commodity Supply Chains. *World Development*, *121*, 163–177. https://doi.org/10.1016/j.worlddev.2018.05.025

Garnevska, E., Liu, G., & Shadbolt, N. M. (2011). Factors for successful development of farmer cooperatives in Northwest China. *International Food and Agribusiness Management Review*, *14*(4), 69–84.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development*, *10*(4), 187–196. https://doi.org/10.1002/sd.199

Gómez, M. I., & Ricketts, K. D. (2013). Food value chain transformations in developing countries: Selected hypotheses on nutritional implications. *Food Policy*, *42*, 139–150. https://doi.org/10.1016/j.foodpol.2013.06.010

Grwambi, B., Ingenbleek, P., Obi, A., Schipper, R. A., & van Trijp, H. C. M. (2016). 8. Towards achieving sustainable market access by South African smallholder deciduous fruit producers: The road ahead. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 161–186). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_8

Hansen, U. E., Nygaard, I., Romijn, H., Wieczorek, A., Kamp, L. M., & Klerkx, L. (2018). Sustainability Transitions in Developing Countries: Stocktaking, New Contributions and a Research Agenda. *Environmental Science & Policy*, *84*, 198–203. https://doi.org/10.1016/j.envsci.2017.11.009

Hansson, H., Thompson, B., Manevska, G., Toma, L., Leduc, G., & Vranken, L. (2019). *Drivers of Farmers' Up-Take of Ecological Approaches – A Conceptual Framework with a Behavioural Focus*. 54.

Harmon, P. (2014). Business process Change: A Business process Management Guide for Managers and Process profesiionals. In *Elsevier*. Elsevier. https://doi.org/10.1016/B978-0-12-800387-9.01001-X

Hastings, K., Howieson, J., & Lawley, M. (2016). Creating value chains: The role of relationship development. *British Food Journal*, *118*(6), 1384–1406. https://doi.org/10.1108/BFJ-10-2015-0389

Heggelund, E. K. (2017). *Future Farmers and Sustainability: A Case Study of Newly Established Farmers in Southern Norway* [Norwegian University of Life Sciences]. https://pdfs.semanticscholar.org/2f06/b8193843a1cd44ce8d300dd80eadb8a20ff9.pdf

Hernández, R. A., Martínez Piva, J. M., Mulder, N., & United Nations (Eds.). (2014). *Global value chains and world trade: Prospects and challenges for Latin America*. Economic Commission for Latin America and the Caribbean (ECLAC). https://www.cepal.org/en/publications/37041-global-value-chains-and-world-trade-prospects-and-challenges-latin-america

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/96/1073

Humphrey, J., & Memedovic, O. (2006). *Global value chains in the agrifood Sector.pdf*. United Nations Industrial Development Organization. https://www.researchgate.net/publication/252624330_Global_Value_Chains_in_the_Agrifood_Sector/link/02e7e53b31ea5c65ae000000/download

Idowu, S. O., & Schmidpeter, R. ´ (Eds.). (2015). *Sustainable Value Chain Management: Value Creation as a Basis for Profitable Growth*. Springer Berlin Heidelberg.

IFAD. (2015). *Sustainable Inclusion of Smallholders in Agricultural Value Chain*. IFAD. https://www.ifad.org/documents/38714170/40264252/Scaling+up+note+-+Sustainable+inclusion+of+smallholders+in+agricultural+value+chains.pdf

Ingram, V. J., Judge, L. O., Luskova, M., van Berkum, S., & van den Berg, J. (2016). *Upscaling Sustainability Initiatives In International Commodity Chains: Examples from Cocoa, Coffee and Soy Value Chains in the Netherlands.* Statutory Research Tasks Unit for Nature & the Environment. https://doi.org/10.18174/389546

Jaffee, Steven. M., & Henson, S. (2005). *Global Agricultural Trade and Developing Countries* (M. A. Aksoy, J. C. Beghin, & World Bank, Eds.). World Bank.

Janker, J., & Mann, S. (2018). *The Social Dimension of Sustainability in Agriculture*. https://www.researchgate.net/publication/322636234. https://www.researchgate.net/publication/322636234

Kaplinsky, R., & Morris, M. (2000). *A handbook for value chain research*. 113. http://www.fao.org/fileadmin/user_upload/fisheries/docs/Value_Chain_Handbool.pdf

Lahti, M., Shamsuzzoha, A. H. M., & Helo, P. (2009). Developing a maturity model for supply chain management. *International Journal of Logistics Systems and Management*, *5*(6), 654. https://doi.org/10.1504/IJLSM.2009.024796

Larsen, M. (2016). Sustaining Upgrading in Agricultural Value Chains? State-Led Value Chain Interventions and Emerging Bifurcation of the South Indian Smallholder Tea Sector. *Sustainability*, *8*(11), 1102. https://doi.org/10.3390/su8111102

Latruffe, L., Diazabakana, A., Bockstaller, C., Desjeux, Y., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2016). Measurement of Sustainability in Agriculture: A Review of Indicators. *Studies in Agricultural Economics*, *118*(3), 123–130. https://doi.org/10.7896/j.1624

Lebacq, T., Baret, P. V., & Stilmant, D. (2013). Sustainability Indicators for Livestock farming. A Review. *Agronomy for Sustainable Development*, *33*(2), 311–327. https://doi.org/10.1007/s13593-012-0121-x

Lee, J., Gereffi, G., & Beauvais, J. (2012). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences*, *109*(31), 12326–12331. https://doi.org/10.1073/pnas.0913714108

Lele, S. M. (1991). Sustainable Development: A Critital Review. *World Development*, *19*(6), 607–621.

Lindgreen, A., Maon, F., & Vanhamme, J. (Eds.). (2013). *Sustainable value chain management: A research anthology*. Gower.

Liu, Y., Eckert, C., Yannou-Le Bris, G., & Petit, G. (2019). A fuzzy decision tool to evaluate the sustainable performance of suppliers in an agrifood value chain. *Computers and Industrial Engineering*, *127*(November 2018), 196–212. https://doi.org/10.1016/j.cie.2018.12.022

Mangla, S. K., Luthra, S., Rich, N., Kumar, D., Rana, N. P., & Dwivedi, Y. K. (2018). Enablers to Implement Sustainable Initiatives in Agri-Food Supply Chains. *International Journal of Production Economics*, *203*, 379–393. https://doi.org/10.1016/j.ijpe.2018.07.012

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: A case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, *21*(1), 73–88. https://doi.org/10.22434/IFAMR2017.0011

Mastronardi, L., Marino, D., Giaccio, V., Giannelli, A., Palmieri, M., & Mazzocchi, G. (2019). Analyzing Alternative Food Networks sustainability in Italy: A proposal for an assessment framework. *Agricultural and Food Economics*, *7*(1), 21. https://doi.org/10.1186/s40100-019-0142-8

McCullough, E. B., Pingali, P. L., & Stamoulis, K. G. (Eds.). (2008). *The transformation of agri-food systems: Globalization, supply chains and smallholder farmers*. Food and Agriculture Organization of the United Nations ; Earthscan. https://www.researchgate.net/publication/241517547_Small_Farms_and_the_Transformation_of_Food_Systems_An_Overview

Meybeck, A. (2016). Concluding Remarks: Sustainability in Food Value Chains: How to Get There? In A. Meybeck & S. Redfern (Eds.), *Sustainable Value Chains for Sustainable Food Systems*. Food and Agriculture Organization of the United Nations.

Miller, C., & Jones, L. (2010). *Agricultural value chain finance: Tools and lessons*. Food and Agriculture Organization of the United Nations ; Practical Action Pub. http://www.fao.org/3/i0846e/i0846e.pdf

Mishra, P. K., & Dey, K. (2018). Governance of agricultural value chains: Coordination, control and safeguarding. *Journal of Rural Studies*, *64*, 135–147. https://doi.org/10.1016/j.jrurstud.2018.09.020

Monastyrnaya, E., Le Bris, G. Y., Yannou, B., & Petit, G. (2017). A Template for Sustainable Food Value Chains. *International Food and Agribusiness Management Review*, *20*(4), 461–476. https://doi.org/10.22434/IFAMR2015.0061

Morone, P., & Cottoni, L. (2016). Transition to a sustainable agro-food system. In *Innovation Strategies in the Food Industry* (pp. 61–76). Elsevier. https://doi.org/10.1016/B978-0-12-803751-5.00004-0

Nastis, S. A., Mattas, K., & Baourakis, G. (2019). Understanding Farmers' Behavior towards Sustainable Practices and Their Perceptions of Risk. *Sustainability*, *11*(5), 1303. https://doi.org/10.3390/su11051303

Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*. Pearson Education Limited.

Norton, R. D. (2017). *The competitiveness of tropical agriculture* (pp. 55–83). Elsevier. https://doi.org/10.1016/B978-0-12-805312-6.00006-4

Nutz, N., & Sievers, M. (2015). A Rough Guide to Value Chain Development: How to Create Employment and Improve Working Conditions in Targeted Sector. In *Ilo*. https://doi.org/10.6084/m9.figshare.106631

Oertwig, N., Galeitzke, M., Schmieg, H.-G., Kohl, H., Jochem, R., Orth, R., & Knothe, T. (2017). Integration of Sustainability into the Corporate Strategy. In R. Stark, G. Seliger, & J. Bonvoisin (Eds.), *Sustainable Manufacturing* (pp. 175–200). Springer International Publishing. https://doi.org/10.1007/978-3-319-48514-0_12

Papadopoulos, S., Markopoulos, T., Chousou, C., Natos, D., & Mattas, K. (2019). Highlighting a Key Question for the Common Agricultural Policy: Adoption of Agriculture System Types. *Int. J. Food System Dynamics*, *10*(3), 250–261. https://dx.doi.org/10.18461/ijfsd.v10i2.16

Pappa, I., Illiopoulos, C., & Massouras, T. (2019). On sustainability of a dairy sector in crisis. *International Journal on Food System Dynamics*, *10*(2), 130–150. https://doi.org/10.18461/IJFSD.V10I2.08

Pérez, R. P., & Oddone, N. (2016). *Strenghtening value chains: A toolkit*. IFAD. https://www.cepal.org/en/publications/40911-strengthening-value-chains-toolkit

Petit, G., Sablayrolles, C., & Yannou-Le Bris, G. (2018). Combining eco-social and environmental indicators to assess the sustainability performance of a food value chain: A case study. *Journal of Cleaner Production*, *191*, 135–143. https://doi.org/10.1016/j.jclepro.2018.04.156

Piedra-Muñoz, L., Galdeano-Gómez, E., & Pérez-Mesa, J. (2016). Is Sustainability Compatible with Profitability? An Empirical Analysis on Family Farming Activity. *Sustainability*, *8*(9), 893. https://doi.org/10.3390/su8090893

Porter, M. E., & Kramer, M. R. (2006). Strategy and society: The link between competitive advantage and corporate social responsibility. *Strategic Direction*, *23*(5), sd.2007.05623ead.006. https://doi.org/10.1108/sd.2007.05623ead.006

Pretty, J. (2008). Agricultural sustainability: Concepts, principles and evidence. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1491), 447–465. https://doi.org/10.1098/rstb.2007.2163

Raworth, K. (2017). *Doughnut Economics: Seven Ways to Think LIke 21st Century Economist*. Chelsea Green Publishing.

Reardon, T., Barrett, C. B., Berdegué, J. A., & Swinnen, J. F. M. (2009). Agrifood industry transformation and small farmers in developing countries. *World Development*, *37*(11), 1717–1727. https://doi.org/10.1016/j.worlddev.2008.08.023

Reardon, T., Lu, L., & Zilberman, D. (2019). Links among innovation, food system transformation, and technology adoption, with implications for food policy: Overview of a special issue. *Food Policy*, *83*, 285–288. https://doi.org/10.1016/j.foodpol.2017.10.003

Rossi, A., Bui, S., & Marsden, T. (2019). Redefining power relations in agrifood systems. *Journal of Rural Studies*, *68*, 147–158. https://doi.org/10.1016/j.jrurstud.2019.01.002

Royer, A., Bijman, J., & Bitzer, V. (2016). Linking smallholder farmers to high quality food chains: Appraising institutional arrangements. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 33–62). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_2

Saunders, C., Dalziel, P., Wilson, M., McIntyre, T., Collier, H., Kaye-Blake, W., Mowat, A., Olsen, T., & Reid, J. (2016). *How Value Chains Can Share Value and Incentivise Land Use Practices: A White Paper* (p. 74). AERU (Agribusiness and Economic Reserach Unit), Lincoln University. https://researcharchive.lincoln.ac.nz/handle/10182/8398

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed). Prentice Hall.

Schneemann, J., & Vredeveld, T. (2015). *Guidelines for value chain selection: Integrating economic, environmental, social and institutional criteria*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, *57*, 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933

Schoon, N., Seath, F., & Laura Jackson. (2013). *One Planet Living—The case for Sustainable Consumption and Production in the Post—2015*.

SDSN. (2013). *Solutions for Sustainable Agriculture and Food Systems*. UNSDSN. www.unsdsn.org

Seidel-Sterzik, H., McLaren, S., & Garnevska, E. (2018). A capability maturity model for life cycle management at the industry sector level. *Sustainability*, *10*(7), 2496. https://doi.org/10.3390/su10072496

Siddique, M. I., Garnevska, E., & Marr, N. E. (2018). Factors affecting marketing channel choice decisions of smallholder citrus growers. *Journal of Agribusiness in Developing and Emerging Economies*, *8*(3), 426–453. https://doi.org/10.1108/JADEE-03-2016-0014

Silva, M. E., & Figueiredo, M. D. (2020). Practicing sustainability for responsible business in supply chains. *Journal of Cleaner Production*, *251*, 119621. https://doi.org/10.1016/j.jclepro.2019.119621

Sjauw-Koen-Fa, A. R. (2012). *Framework for an inclusive food strategy: Co-operatives—A Key for smallholder inclusion into value chains* (pp. 2–44). Rabobank. https://www.researchgate.net/publication/283419481_Framework_for_an_inclusive_Food_Strategy_Co-operatives_-_a_key_for_smallholder_inclusion_into_Value_Chains

Sjauw-Koen-Fa, A. R., Blok, V., & Omta, O. S. W. F. (2016). Critical success factors for smallholder inclusion in high value-adding supply chains by food & agribusiness multinational enterprises. *International Food and Agribusiness Management Review*, *19*(1), 83–112.

Smith, A., Voß, J.-P., & Grin, J. (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research Policy*, *39*(4), 435–448. https://doi.org/10.1016/j.respol.2010.01.023

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Sulewski, P., Kłoczko-Gajewska, A., & Sroka, W. (2018). Relations between agri-environmental, economic and social dimensions of farms' sustainability. *Sustainability*, *10*(12), 4629. https://doi.org/10.3390/su10124629

Tan, J., & Zailani, S. (2009). Green Value Chain in the Context of Sustainability Development and Sustainable Competitive Advantage. *Global Journal of Environmental Research*, *3*(3), 234–245. https://www.semanticscholar.org/paper/Green-Value-Chain-in-the-Context-of-Sustainability-Tan-Zailani/0348309593a8473e32dd742f747eb19689c7ae7b

Thorpe, J. (2018). Procedural justice in value chains through public–private partnerships. *World Development*, *103*, 162–175. https://doi.org/10.1016/j.worlddev.2017.10.004

Tomich, T. P., Lidder, P., Coley, M., Gollin, D., Meinzen-Dick, R., Webb, P., & Carberry, P. (2019). Food and agricultural innovation pathways for prosperity. *Agricultural Systems*, *172*, 1–15. https://doi.org/10.1016/j.agsy.2018.01.002

Tray, B., Garnevska, E., & Shadbolt, N. (2021). Linking smallholder producers to high-value markets through vegetable producer cooperatives in Cambodia. *International Food and Agribusiness Management Review*, 1–16. https://doi.org/10.22434/IFAMR2020.0135

Trienekens, J. H. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review*, *14*(2), 32.

Trienekens, J., van Velzen, M., Lees, N., Saunders, C., & Pascucci, S. (2018). Governance of market-oriented fresh food value chains: Export chains from New Zealand. *International Food and Agribusiness Management Review*, *21*(2), 249–268. https://doi.org/10.22434/IFAMR2017.0063

United Nations. (2013). *Sustainable development challenges*. United Nations.

van Dijk, P. M., & Trienekens, J. (Eds.). (2012). *Global Value Chains: Linking Local Producers from Developing Countries to International Markets*. Amsterdam University Press.

Vroegindewey, R., & Hodbod, J. (2018). Resilience of agricultural value chains in developing country contexts: A framework and assessment approach. *Sustainability*, *10*(4), 1–18. https://doi.org/10.3390/su10040916

WTO. (2019). *Global Value Chain Development Report 2019: Technological Innovation , Supply Chain Trade, and Workers in A Globalized World*.

Zocca, R. O., Gaspar, P. D., da Silva, P. D., Nunes, J., & de Andrade, L. P. (2018). Introduction to sustainable food production. In *Sustainable food systems from agriculture to industry* (pp. 3–46). Elsevier. https://doi.org/10.1016/B978-0-12-811935-8.00001-9

CHAPTER 3
Transforming developing countries agrifood value chains

This chapter presents an assessment and evaluation of agrifood value chain practice, which then led to the identification of transformation routes with a focus on Indonesia, a developing country. This chapter has been published in the International Journal on Food System Dynamics (IJFSD) in September 2021, which is a Scopus indexed and a peer-reviewed journal containing a high-profile editorial team across the University in the world. It is a journal dedicated to publishing research on the management and strategic development of the food system and its actors. This is a Q2 journal with impact factor of 1.162 (a 3-Year Impact Factor). The paper has received two citations.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://dx.doi.org/10.18461/ijfsd.v12i4.96.

Additional note:

1. The author presented this paper at the New Zealand Resources and Economic Society (NZARES) conference as the recipient of the Post Graduate Award in 2021.

Hidayati D.R, Garnevska, E. and Childerhouse P., 2021. Sustainable transformation of agri-food value chains, *New Zealand Agricultural and Resource Economics Society (NZARES)*, Nelson, New Zealand, 2-3 September 2021. (2021 NZARES award).

2. A paper relevant to this chapter was presented at the International Conference on Assessment and Development of Agricultural Innovation (ICADAI) in 2021, where the author also received the best oral presenter award among ten participants in the session.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Agrifood value chain assessment in developing countries: A case of Indonesia's cashew sector. *E3S Web of Conferences*, *306*, 02045. https://doi.org/10.1051/e3sconf/202130602045.

Abstract

The global agrifood trade is highly reliant on developing countries, which affects value chain transformation and which often results in an imbalance of governance and value addition. In order to address this imbalance and increase the overall value creation, this paper develops and empirically tests a framework for agrifood value chain transformation in developing countries. The research employs a qualitative methodology to explore the proposed framework, which is based on a value chain maturity assessment of current practice and identification of a transformation route. Three primary value chain maturity levels in developing countries are established: traditional, managed, and best practice. Each level is determined using key indicators relating to governance (vertical-horizontal coordination, and information flow) and value addition (value orientation, safety, and quality). The application of this framework to Indonesia's cashew nuts value chain reveals a mix of traditional and managed practices. The short-medium term transformation focuses on enabling farmers, as the decoupled actors, to advance from a traditional to a more managed chain. Further, the major wholesaler and exporter are identified as highly influential in driving the transformation process. The long-term transformation focuses on developing best practices regarding branded value addition and collaborative governance. This framework offers a novel value chain transformation approach based on a maturity assessment technique leading to the identification of transformation routes. This method takes a holistic transformation approach via the evaluation all the value chain actors' governance and value-addition capabilities. Follow-up research is required to identify the enablers and barriers of globalised value chain transformation, especially with respect to sustainability.

Keywords: Value chain transformation; maturity level; developing countries; agrifood, cashew nuts

3.1 Introduction

Many agrifood value chains in developing countries are currently facing challenges to transform and become more globally integrated. Globalization has increased market access and recued traditional barriers to source location and the logistical flows of food production and processing (Collins, 2014). Along with globalization, sustainability has emerged as an increasingly pressing issue and has fueled the importance of safety and quality in the food sector (Liu et al., 2019). As high-value food chains are mainly produced in developing countries (Royer et al., 2016), the global

agrifood industry is largely concerned with ways of effectively structuring value chains. Sourcing activities, in particular, have received increasing attention as the industry seeks to secure food quality and safety through vertical coordination in developing countries (Hernández et al., 2014).

Despite the increase in global value chain (GVC) integration, transforming value chains in developing countries is challenging. The transformation process often results in an imbalance in terms of governance and value addition. This is because the predominant actors of value chains in developing countries are smallholders (Mishra & Dey, 2018; Siddique et al., 2018). However, global sourcing tends to prioritize processors and consumers over smallholder farmers (Sjauw-Koen-Fa et al., 2018). Thorpe (2018) argues that when smallholder farmers are included in global value chain governance, they are kept in a weak position and lose out on higher value selling opportunities, because the global player's leverage their technical expertise and market access. These global players are progressively targeting developing countries sources (WTO, 2019), whilst retaining the higher value-add activities (Trienekens, 2011). The upshot is that global players exert their power to capture most of the value, while smallholder actors in developing countries have limited ability to retain the value of commodity exports. Globalization, therefore, leads to social and economic inequalities between developed and developing countries (Cavagnaro & Curiel, 2012).

Previous research into value chain transformation has focused on integrating the domestic production into the global value chain by emphasizing transaction costs, market linkages, value chain upgrading, and poverty reduction (Gómez & Ricketts, 2013; McCullough et al., 2008; Reardon et al., 2009; Donovan et al., 2015). These areas of focus have provided valuable insights with respect to facilitating value chain development, but the integration structure of these transformation processes has been largely overlooked. More specifically, there has been minimal attention on ways of effectively transforming and integrating a value chain and aligning it to a framework structured around maturity levels of practice with respect to governance and value addition. Integrated practices could provide more collaborative actions in planning, problem solving, and improvement of positions through an open information exchange (Childerhouse & Towill, 2012). An evaluation of value chains that is underpinned by a focus on transformation pathways will enhance understandings of how to facilitate the participation of actors in developing countries with respect to global agrifood trade.

This paper develops and empirically tests a novel framework for agrifood value chain transformation with a focus on Indonesia, a developing country. The primary objective of this paper's framework development is the use of value chain maturity as a means for evaluating current value chain status which then leads to the identification of transformation routes. The importance of maturity level assessment lies in the provision of critical elements for an evolutionary analysis in terms of experience and the quality of practices (Lahti et al., 2009). The maturity levels employed in this paper are constructed around governance and value addition, elements drawn from theoretical work on the value chains of developing countries. Hence, the findings of this paper will help to refine knowledge around the participation of developing countries in global trade. Indonesia's cashew nut sector is used as a case study to demonstrate the application of the framework forwarded by this paper. Nearly 99% of cashew nut production in Indonesia is under smallholder farmers (Ministry of Agriculture, 2017) and, to date, most studies of this industry have examined production aspects (Rosman, 2018; Susanto, 2018) and competitiveness (Fauziyah et al., 2017; Zahir & Sanawiri, 2018). Meanwhile, the majority of value chain studies have taken place in Africa (Bassett et al., 2018; Monteiro et al., 2017), Vietnam (Chi et al., 2018), and India (Manikandan et al., 2017). As a key supplier of the raw ingredient in the region, Indonesia's cashew nut industry offers a novel opportunity to investigate a value chain in the context of a developing country.

This paper is structured as follows: the next section is a literature review which forms the theoretical bases for this paper's framework development. The review focuses on research on value chain theory with respect to developing countries. Next, the method section explains and justifies the approach employed in this paper before the results section reports on the empirical application of the framework and identifies key findings. The last two sections, the discussion and the conclusion, connect the findings derived here to prior research and draw out the original contributions.

3.2 Literature Review

The value chain (VC) concept has an embedded approach that facilitates the exploration of transformation knowledge. This concept has a strategic tool to identify potential stages to increase customer value and to understand business relationships (Chofreh et al., 2019), and it also foregrounds the dynamic inter-linkages of various productive sectors to enable global integration (Kaplinsky & Morris, 2000). From this, the capacity of the value chain to formulate transformation

strategies comprise three key elements: value source activities, relationships, and the interconnections between activities that bring value.

3.2.1 Value chain transformation perspectives

Research on agrifood value chain transformation includes a range of perspectives, reflecting the impact of rapid business changes and shifts in the way this concept has been focused and framed. For example, the definition by Reardon et al. (2009) places an emphasis on the restructuring of the agrifood sector within the procurement of a modernized system. Indeed, the agrifood value chain has evolved towards a modern system to provide greater value to consumers in the form of more processed products and consistent standards, with respect to product quality and safety practices (Miller & Jones, 2010). However, the processing of plant-based and highly perishable products make the agrifood sector sensitive to the raw market behavior and market organizations (Zocca et al., 2018). Table 3.1 summarizes relevant value chain transformation perspectives by focusing on developing countries.

Table 3. 1. Summary of relevant value chain transformation perspectives

Transformation Concept	Indicators	Source
Traditional into Modern VC	Transaction scale, investment, stages (wholesale, processing, retail, procurement system, standard) vertical coordination	Reardon (2009)
	Supplier, market, coordination, product availability, profit, and market share	Gómez & Ricketts (2013)
	Value chain upgrading through the process, product, functional/interchain, intra chain	Gereffi et al. (2001); Kaplinsky & Morris (2000)
	Value chain upgrading through the process, product, functional/interchain, intrachain, horizontal coordination, vertical coordination, enabling environment	Mitchell et al. (2009)
Traditional-Transitional-Modern VC	Spatial orientation, fragment structure, technology within labor utilization, standard (public and private), market orientation	Reardon et al. (2019)
Domestic Traditional Chain- Domestic Modern Chain-Export Chains	Stages practices (consumption, retail, processing, wholesale, procurement system, production system), vertical coordination	McCullough et al. (2008)
Traditional Chain, Managed Chains, Best Practice Management	Value orientation characteristic (balance between price and value, information sharing, time orientation, relationship, interaction, dependence in the chain, power in the chain, orientation)	Collins (2014)
Value Chain Development	Integration, market access, supporting functions, rules of the game,	ILO (2016)
Resolving Bottlenecks to Strengthen Value Chain	Governance and value chain upgrading	Pérez & Oddone (2016)

Most of these studies suggest that, for developing countries, the transformation will generally start from a traditional value chain model to a modern value chain model**.** A traditional value chain is customarily practiced by an agriculture-based economy with small-scale farmers and traders as primary suppliers, and wholesalers who link the producers with small-scale processors and retailers (McCullough et al., 2008). According to Gómez and Ricketts (2013), many developing countries change the orientation of the value chain to a final market focus through the involvement of multiple value chain actors that are attached to the modern domestic market, however, this is not always the case. For example, the product flow may focus on export markets as well as domestic markets (Norton, 2017). Kaplinsky and Morris (2000) contend that for export-oriented products, the value chain may target specific destinations. Exporters often target their needs to specific raw commodities or processed products by proliferating vertical coordination in developing countries

(Hernández et al., 2014). As such, three major value chain orientations can be summarized: Traditional Value Chain, Modern-Domestic Value Chain, and Modern-Global Value Chain. In order to focus on managing the value chain integration, Collins (2014) suggests employing three levels of orientation: traditional chain, managed chain, and best practice value chain.

The aforementioned studies (Table 3.1) offer useful insights to assess and transform value chain through different means and indicators. Most of these studies have considered transaction costs, coordination along with market linkages (Gómez & Ricketts, 2013; Reardon et al, 2019; ILO, 2016), and value chain upgrading (Gereffi et.al,2001; Kaplinsky & Morris, 2000; Mitchell et al, 2009, Pérez & Oddone, 2016). Although these indicators are important in enhancing value chain practice, these studies have given limited consideration to how an integration that aligns with the value chain structure may be achieved. As Griffith et al. (2017) note, structure is essential in value chain practice enhancement. Indeed, some scholars have looked at structure-based transformations which reflect current levels of practice (Minten et al., 2020; Reardon, 2015), but a systematic approach to realizing these transformations remains underdeveloped. Typically, value chain transformations in developing countries fail to give sufficient recognition to structure-based transformations which, in turn, result in an immature integration that is unable to gain optimum benefits. As Lee et al. (2010) argue, the value chain benefits derived by the main actors of developing countries primarily depend on the structure in which they are involved. A lack of integration often causes a critical gap in practices, such as mismatching goals, disjointed planning, discrepant schedules and timeframes and incompatible work cultures (Childerhouse & Towill, 2006). A transformation of the value chain into an aligned structure is therefore critical. A key insight drawn from the aforementioned studies, and which underpins this paper's approach, is the way in which actors both integrate to improve their role and interact to enhance value creation. This insight enables the identification of two dominate value chain dimensions: governance and value addition.

Governance includes three elements: vertical coordination, horizontal coordination, and information. The vertical coordination element involves power distributions along the chain (FAO, 2014; Mitchell et al., 2009), the relationship between actors (Trienekens et al., 2018), transaction terms, profit orientations, negotiations and standard settings (Collins, 2014). Strong vertical integration enables powerful interlinkages and actions between actors in the chain. In contrast, horizontal coordination relates to the collective actions between similar players, such as producer organizations (PO) and cooperatives, which aim to improve productivity, market access, and inclusiveness by strengthening the bargaining power of farmers/members (FAO, 2014a) and greater

economies of scale (Thorpe, 2018). Garnevska et al. (2011) suggest that the successful development of POs has been majorly beneficial to members and their rural communities. The third element of governance, efficient information flows and sharing, positively affect performance (Bochtis et al., 2019). Efficient information may be defined as a symmetrical flow of information and significant information sharing between value chain actors. Information asymmetry may lead to market failure (Mishra & Dey, 2018; Reardon et al., 2009), whilst information accuracy affects decision making (Collins, 2014).

Value addition puts quality, safety and value orientation as the most critical attributes, which can be evaluated through a series of agrifood product transformation activities (Collins, 2014; Norton, 2017). Pre-harvest quality is where the value to be added aims to keep the product fresh and ensure quick transportation whereas post-harvest quality is focused on transforming raw materials into various processed activities (Berry et al., 2015; Norton, 2017). Many authors have also examined the issue of quality interpretation based on private and public standards (Jaffee & Henson, 2005; Reardon et al., 2009). This attention is owing to the way in which private standards gained a competitive advantage by recognising a proliferation of expectations and subsequently capturing value in the food industry (Lee et al., 2010). Food safety is another issue that has gained scholarly attention. Collins (2014) defines food safety as preventing the microbiological contamination of products beyond permitted limits, and involves trust-building and production methods. The issue of food safety has also broadened to encompass traceability (Lee et al., 2010). Finally, value orientation (from the lowest to the highest value) has a vital role in value-added activities (Collins, 2014).

3.2.2 Agrifood value chain transformation and maturity level assessment

Understanding the value chain transformation in relation to an integration structure requires an appropriate assessment tool. Value chain mapping is acknowledged as a baseline assessment of current value chain practice (Chofreh et al., 2019; Zokaei, 2010). However, maturity level assessment offers a powerful analytical tool to understand the phenomena of value chain transformation since it accords value chain mapping with the status of practice identification. Maturity level concepts have received increasing attention in chain practice discussions, either as assessment instruments or as part of an improvement framework (Lahti et al., 2009). However, the concept of maturity levels has been primarily developed in the industrial sector (Batista et al., 2019;

Seidel-Sterzik et al., 2018), and applications of this concept to value chain transformation contexts are rare.

This paper explicitly designs the maturity level assessment to facilitate agrifood value chain transformation in developing countries. Although other maturity levels have been established using scales evaluation, such as numerical (Done, 2011) and standard performance (Seidel-Sterzik et al., 2018), this study delineates maturity levels based on normative practices in developing countries, to reflect transformations from the lowest levels of practice to more advanced levels. The value chain maturity level assessment is guided by the recognition that prevailing actors are a prerequisite to orchestrate transformation into their respective routes. In this light, local actors are regarded as part of the developing country's strategic value chain design (Donovan et al., 2015). Table 3.2 summarizes the maturity levels found in typical value chain transformations in developing countries.

Table 3. 2. The maturity levels in typical value chain transformations in developing countries

Indicators	Traditional Chain	Managed Chain	Best Practice Chain
Governance			
a.Vertical Coordination	Short term transaction-based, Self-maximizing, Adversarial, Price-based negotiation, No standard product, Centralized to wholesaler channels	Ruled short term-medium transaction, Chains profit as the second priority, Firms are the negotiator, Upstream standard within downstream management	Binding medium-long term transaction, Chains maximization, Collaboration, Total focus on consumer standard arrangement
b.*Horizontal Coordination*	Independent actors and individual power	Usually relies on others	Interdependence with consumer's power
c.Information sharing	No significant sharing (asymmetry)	Some information sharing	Extensive-direct information sharing (symmetry)
Value Addition			
a.Safety	No traceability, no standard	Some linkages with private standard available for traceability	Public liability and safety standard
b.Quality	Public standard	Private standard and quality control based	Tight private standard
c.Value Orientation	Commodity based and unsegregated (least value)	More processed based (more value-added)	Brand and certified processed based (highest value)

Modified from relevant sources (Collins, 2014; Humphrey & Memedovic, 2006; McCullough et al., 2008; Reardon et al., 2009)

Table 3.2 shows the crucial gaps in the value chain maturity levels based on integration. In most discussions, integration is regarded as an indispensable element to achieving a successful operation (Childerhouse & Towill, 2011). The traditional value chain practice features a less-integrated value chain. Informal coordination systems on governance and commodity-based value addition prevail for various reasons. The agrifood commodities are predominantly produced by smallholders, who have low production volume, inconsistent quality standards, limited capacity for high-value addition, and poor market access (Mishra & Dey, 2018; Sjauw-Koen-Fa, 2012).

The managed value chain tends to have a more formal system with integrated governance and control of value addition. As mentioned earlier, most chains in developing countries target modern-domestic markets (Gómez & Ricketts, 2013). Hence, the structuring of a traditional value chain into a modern chain involves the need to produce a standardised product. As the agrifood industry increases the importance of private standards (Lee et al., 2010), modern-domestic chains frequently

involve the role of firms to control and engage in more information sharing compared to those in traditional chains (Collins, 2014).

The best practice chain, which aims at global markets, is associated with mature governance and selective chain participation within a high-value market focus (Mishra & Dey, 2018). The best practice chain tends to incorporate and involve collaboration to generate best value benefits for global consumers. It often involves certified brands of leading firms (Lee et al., 2010). The greatest distinction between modern-domestic and modern-global markets is the governance power at hand, wherein global leading firms are powerful in directing the business (Gereffi et al., 2001; Kaplinsky & Morris, 2000). In addition to this, sustainable practices are strongly associated with global market functions (Pappa et al., 2019) and global buyers typically demand certifications as a form of guarantee (Hernández et al., 2014).

3.2.3 Modified agrifood value chain transformation framework

Based on the theoretical approaches discussed, Figure 3.1 illustrates a modified framework as an alternative value chain transformation method:

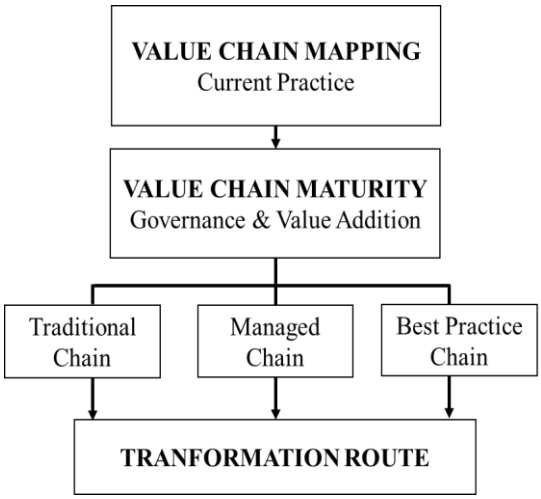


Figure 3. 1. Value chain transformation framework

This framework views the value chain transformation as an integration effort between value chain actors aiming to achieve greater inclusion and more beneficial value participation through an alignment between governance and value addition. The initial step of the framework is value chain mapping to collect an initial overview of key actors and their current practices (DFID, 2008). The next step includes assessing the current status of the three value chain maturity levels: traditional

chain, managed chain, and best practice chain. The status of each maturity level is assessed in relation to governance (vertical integration, horizontal integration, information flow) and value addition (value orientation, safety, and quality). Based on the maturity level assessment results, the final step involves identifying the value chain transformation route. This step identifies where, in relation to governance and value addition, the practice requires enhancement. These are noted as flaws in the current practice, which need to be changed in the future while preserving the benefits of the current practice. The actors who suffer most of the vulnerabilities are seen as decoupled actors. In order to transform the value chain, the power holder actors need to work with the decoupled actors to orchestrate the transformation towards the appropriate route. The sequences outlined in Figure 3.1 aim to offer a consistent structure in the value chain transformation for actors in developing countries.

3.3 Case study application

3.3.1 Description of the case study area

Indonesia is an agricultural-based developing country, which is seeking an agrifood value chain transformation opportunity by encouraging and prioritizing the export of high-value products. The agricultural sector employs around 31% of the total labour force and utilizes a similar proportion of the country's landmass (FAO STAT, 2017). The agricultural sector plays a primary role in the nation's food supply, GDP contribution, rural household income and labor absorption (Ministry of Agriculture, 2015; Statistics Indonesia, 2018). One of the high value food products that has been identified as a positive contributor to the nation's economic development is cashew nuts (Dendena & Corsi, 2014).

Indonesia is a notable global producer of cashew nuts, with aspirations to expand further. However, over 70% of its cashew nut production is exported to other countries as a raw commodity (Ministry of Agriculture, 2017). As the cashew nut is a high-value food with perceived health benefits (Vadivel et al., 2012), in 2014, Indonesia's Ministry of Trade proposed to restrict exports of raw cashew nuts. The 'Cashew Nuts Belt' program, consisting of extensification and intensification, targets the main producer areas in Indonesia (Plantation Agency of East Java Province, 2014). In 2016, a government regulation earmarked cashew nuts as a potential commodity to receive support in terms of planting and the processing of capital investments (Presidential Regulation, 2016). With Indonesia's cashew nut industry reaching a pivotal point in

its development, an evaluation of its value chain transformation path is both timely and apt as a case study for value chain transformations in developing economies.

Empirical data was collected over a five-week period in early 2020 on Madura Island of East Java Province, a notable cashew production region in Indonesia. With government assistance, Madura Island implemented the 'Cashew Belt' program in 2014, with the aim of developing and intensifying an area of approximately 2,660 ha (Plantation Agency, 2014). In total, the cashew planting area was around 30,167 ha, with approximately 0.76 ton per ha productivity (Susanto, 2018). This area is adjacent to Indonesia's second largest city, Surabaya (shown in Figure 3.2), which is also the location of the trans-national trade port facility (Widjaya & Tanuwidjaja, 2017). Of the four Regencies on Madura Island, Sumenep Regency was selected for this study because it is the main producer of cashews (Jadid et al., 2017).

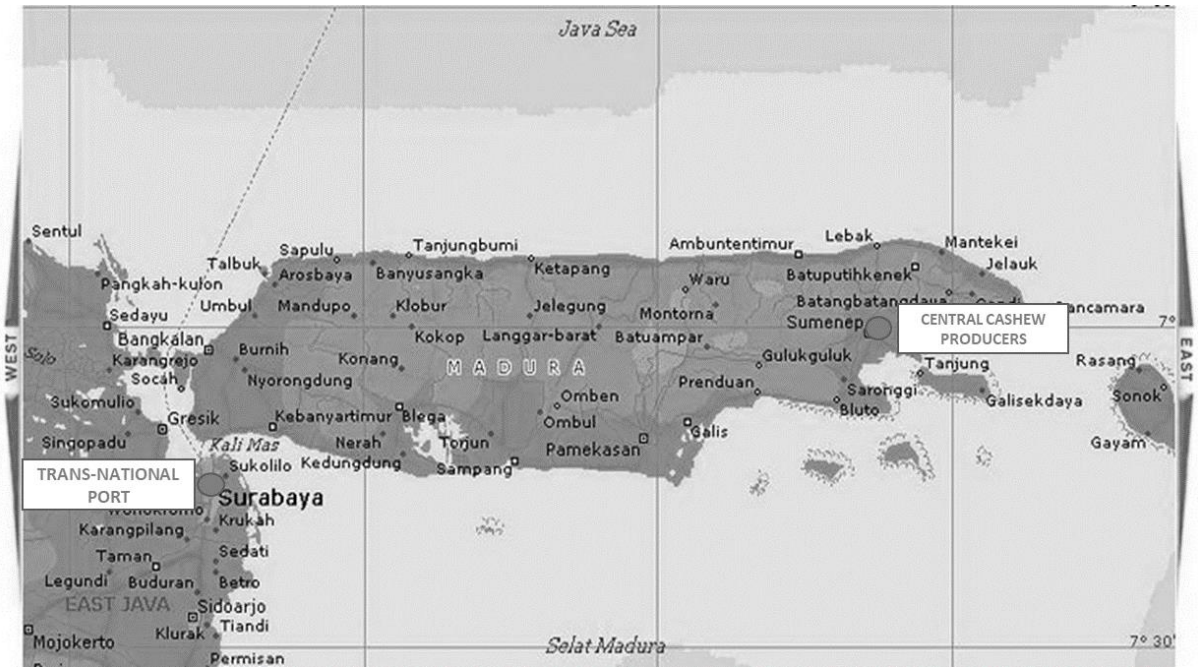


Figure 3. 2. Madura Island and Surabaya port
(Source: https://peta-kota.blogspot.com/2011/07/peta-pulau-madura.html)

3.3.2 Case study methodology

This study conducted semi-structured face-to-face interviews with 25 participants who were either value chain actors or experts from associated government agencies. A qualitative approach was employed to allow for a rich exploration and understanding of phenomena relating to social

and human problems (Cresswell, 2014), in this case, the current practices of Indonesia's cashew nut industry. Discussion topics were developed from the framework by focusing on governance and value-added activities. As Cresswell (2014) argues, qualitative methods encourage participants to share their views, and in this study, respondents were asked to comment based on their experiences and to provide additional information to support their perspectives. In order to maintain the reliability and validity of the data, interviews were combined with photographs, recordings, and relevant secondary documentation.

Snowball sampling was used to identify participants who were value chain actors. This sampling method is crucial for gathering data from a fragile population, as samples need to be collected from within a social context that involves multi-stage processes (Naderifar et al., 2017). In this study, the identification of potential interviewees subsequently led to the recruitment of their contacts as other potential interviewees. The data set includes seven farmers, three heads of farmer groups, five intermediaries (including a wholesaler), two processors, and one major exporter. Participants representing expertise from the government agencies comprised two officers from the Agricultural and Plantation Agency, one officer each from the Cooperative and Small-Medium Enterprise Agency, and the Trade-Industrial Agency and, finally, three extension workers who assist the local farmers with accessing governmental aid. The qualitative data collected from the interviews were analysed using spiral analysis. This approach involves the classification of categories and sub-categories in an iterative process (Cresswell, 2014).

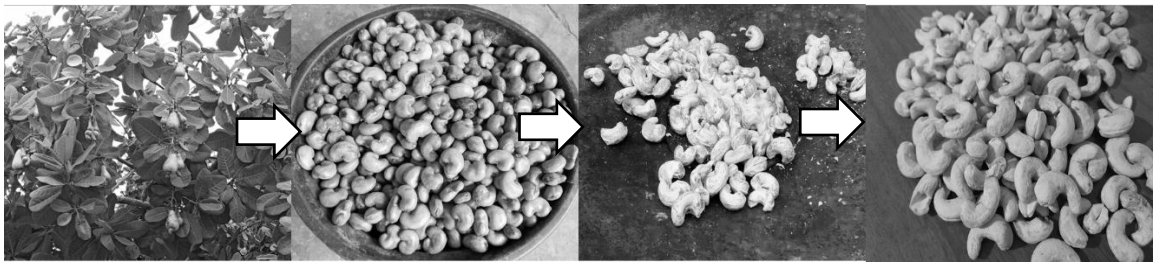
3.4 Findings

This section outlines the findings of this study with respect to how the framework presented earlier in this paper applies to Indonesia's cashew nuts sector.

3.4.1 Value chain mapping

The results of this study show that around 75% of the cashew nuts produced are exported as a raw material and the remaining 25% are marked for domestic consumption and processing (i.e., fried and roasted nuts). The prevalent domestic market is local retail (i.e., snack stores and traditional markets).

A basic knowledge of the cashew nut material flow in the study area is vital for understanding the overall value chain phenomena. The starting point is the cashew apple (which produces the nut), which is harvested at the farming stage (Figure 3.3a). The nut is the trading component while the cashew apples are either discarded or used as livestock fodder. This pre-harvest quality nut is the 'wet-in-shell' nut (Figure 3.3b) which are assessed in terms of skin, colour, and size. The nuts then require drying in the sun for about three to four days before they can be stored. This process results in a 'dry-in-shell' nut quality (Figure 3.3b), which enables the nut to be preserved for about a year. This quality nut is then un-shelled by a tool called the 'kacep'. The process of un-shelling results in nuts with cuticles (Figure 3.3c). In order to remove the cuticles, the nuts must be exposed to a short roasting period to make them easy to hand-peel. The end-product of this process produces the 'shelled nut' quality (Figure 3.3d), which allows for further processing purposes, such as roasting and frying. The overall product transformation is shown in Figure 3.3.



a. Cashew apple fruit **b. wet/dry- in-shell nuts** **c. Cuticle nuts** **d. Shelled nuts**

Figure 3. 3. Cashew nuts material flow

The complex features of each actor's contribution to the cashew value addition are shown in the value chain map in Figure 3.4. Overall, the cashew nuts value chain actors consist of an overwhelming majority of smallholder farmers (producers), many small-scale intermediaries, some wholesalers, and a small set of exporters (both domestic and international firms).

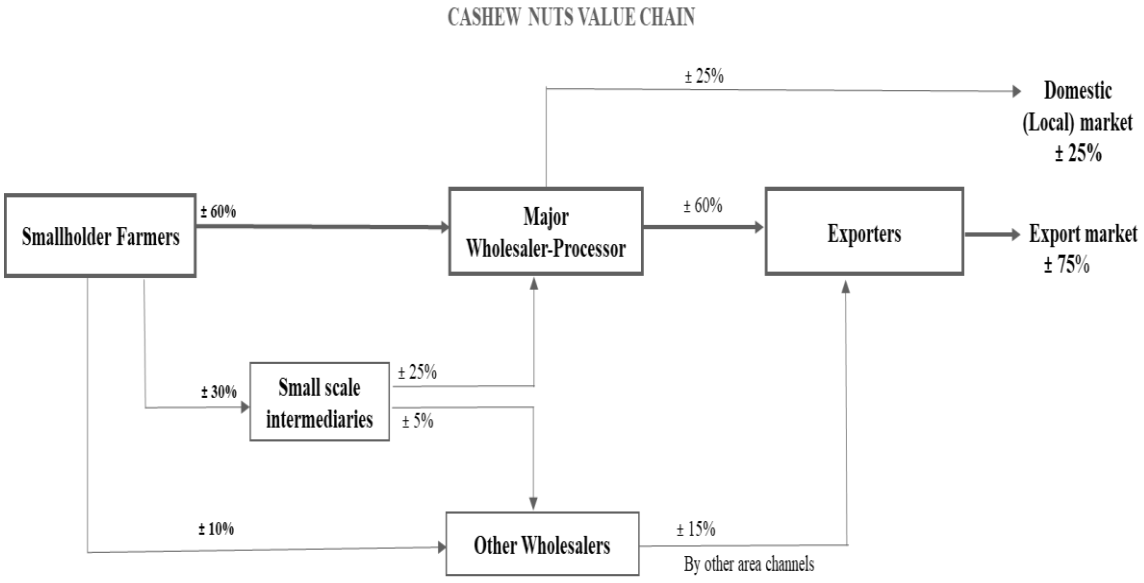


Figure 3. 4. Cashew nuts value chain

Smallholder Farmers – There is a large number of smallholder cashew farmers in the study area, each of whom have approximately 0.3 ha up to 0.4 ha of farmland with less than 100 trees. Most of these farmers primarily produce crops such as corn and paddy rice and have cashew nuts as a supplementary crop. Interviewees in this study explained that the cashew farm they managed is a family business, inherited over generations. Cashew farming largely takes place in the cultivation of berms with low input systems, is diversified with seasonal crops (e.g., corn or paddy) and involves family labor with minimal technical skills required. Newly planted cashew trees from government grants were also incorporated in a similar way. Harvesting activities involve various methods (i.e., the pole-hook, cone-shaped pole, climbing method, and '*penyandek*'/pick up). After harvesting, farmers sell cashew nuts in the 'wet-in-shell' quality, and information on the prices these products fetch are primarily gained from small-scale intermediaries or wholesalers. Interviewees indicated that approximately 60% of the cashew nuts were sold to the main wholesaler through spot price transactions. Although there are farmers groups which provide information to farmers, few of these groups deal with cashew nuts.

Small Scale Intermediaries - The small-scale intermediaries have a sporadic role in collecting products which vary in quantity and quality (approximately 30% of products). The buying volume ranges from 50 kg up to one quintal (100 kg) in the form of 'wet-in-shell' nuts. In most practices, no value is added to the cashew nuts since the raw products are directly sold to the wholesalers.

Often, the intermediaries borrow money from wholesalers to buy cashew nuts from farmers, and then on sell them back to the wholesaler.

Major Wholesaler-Processor - The major actor in this region is the wholesaler who plays a central role in collecting and processing the cashew nuts. This key actor gathers most of the cashew nuts in the area, which are diverse in their variety and quality. The cashew nuts are either resold to the exporters as a commodity (about 70%), stored (for future selling), or undergo further processing. This actor controls the major cashew processing work in the area by employing families and local communities. The wholesaler in this study, for instance, indicated that approximately 25 home industry peelers were employed to do the work of un-shelling, most of whom were women in local neighbourhoods. This actor has also established bilateral contracts with exporters (since 2010) using two types of contracts: short-term (i.e., 15 days with around 60-tonne transactions), and long-term contracts (i.e., one month with hundred-tonne transactions). Currently, this actor also heads the East Java Association of Cashew Nut Farmer Indonesia (APJMI). APJMI aims to establish collaborative networks between cashew nuts growers.

Other Wholesalers - this group manages other channels for raw nuts (about 15% share). Their role is similar to that of the major wholesaler, in terms of collecting raw cashew nuts. However, their value-added activity is limited to a drying process for storage purposes. These players sell the cashew nuts to other wholesalers in Sampang Regency (Madura Island neighbourhood regency), who will trade further with exporters. Sampang Regency is also known as a key area where cashew nuts are un-shelled, and some raw cashew nuts traded into this area are also further processed.

Exporter - The exporters in this study have mostly established contracts with the major wholesaler. In total, around 75% of local cashew nuts are traded through exporters with specific quality requirements (dry-in-shell nuts, less than 200 nuts per kg, and 1 kg in-shell nuts that are equal to 300 grams shelled nuts). Before exporting the cashew nuts, exporters have to comply with various product specifications, such as water content, moisture level, and yeast content, in addition to having a phytosanitary certificate. In general, the exporters are categorized as either foreign or domestic companies. The foreign companies are mainly from India and Vietnam. The domestic company interviewed is a processed-based exporter, who pioneered the cashew business in Indonesia (since around 1975). This company exports ‘dry-in-shell’ nuts to India and Vietnam, and processed nuts

to China, the United States, and Europe. Currently, the company's executive leader is involved in a cashew nuts industrial association (known as PERMETIN).

3.4.2 Cashew nuts value chain maturity level

Based on the cashew nuts value chain mapping, the maturity level assessment is presented in Figure 3.5, illustrating each actor's current practice status. To reiterate, the status of each maturity level was assessed based on governance and value addition activities in order to categorize the practice into one of three levels: traditional chain, managed chain, and best practice. Governance activities were either classified as informal, formal, or collaborative. Whereas, the value addition activities were either identified as commodity-based, processed based, or high-value products.

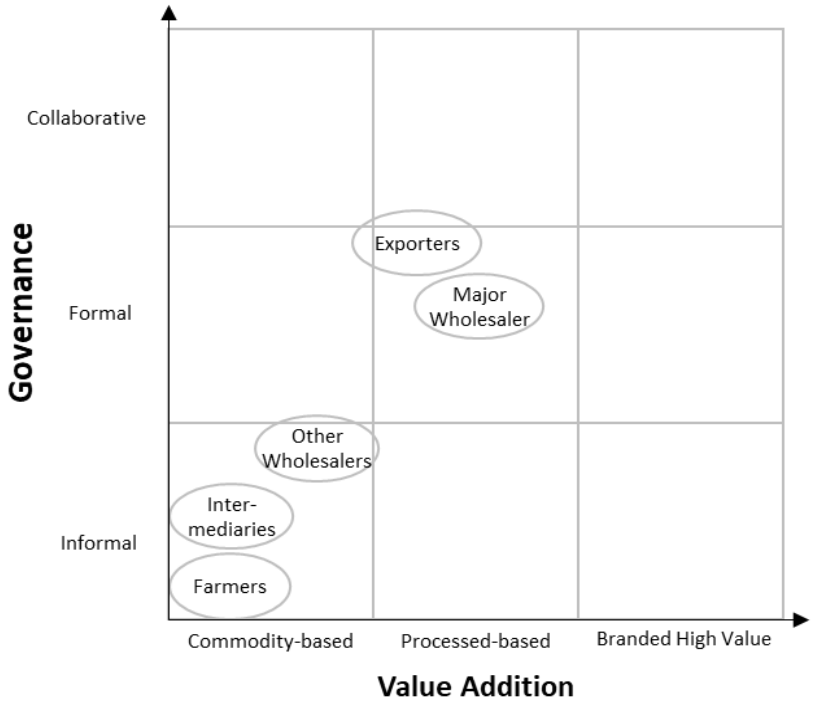


Figure 3. 5. Cashew nuts value chain player maturity level

The overall maturity level assessment revealed a large gap in the activities between actors and the value restrictions imposed on a raw material trade, which will now be explored.

Governance

Most of the chain actors (farmers and most of the intermediaries) in this study are involved in informal relationships, whereas, the contractual/formal relationship was specifically arranged

between the main wholesaler and exporters with limited collaboration. Many of the value chain practices are transaction-based (small-scale and short-term) with limited standard requirements and bargaining opportunities. In contrast, the contracts between the main wholesaler and exporters have a set of arrangements for quality and quantity for each harvesting season. It should also be noted that the major wholesaler played the role of sole networking-trading agent between cashew producers and potential buyers.

Farmer groups had a limited role in the cashew nuts value chain in the area studied. The farmer group were mainly helping farmers to gain support from government programs because many of the members were involved in multi-crop activities. As a result, farmers mostly acted as independent actors with individual power (farmers were free to decide how to sell the product and to whom). One of the interviewees from a farmer group remarked that there was insufficient commitment from members of the group to enhance their bargaining position through collective action. In addition to this, information sharing was largely asymmetric. Although exporters provided detailed information about the required price, quality, and quantity of the product to the major wholesaler, farmers were generally unaware of these specifications.

Value Addition

The results revealed that most of the value chain actors tended to give minimal consideration to aspects relating to safety, product quality, and value orientation. In particular, the farmers' focus on producing the basic commodity, cashew nuts, meant that their farming practices overlooked numerous opportunities for value addition. For instance, many farmers could not identify their cashew trees in terms of the variety and age, causing inefficient productivity and lack of traceability. This is because cashew farming is a supplementary income and the farmers prioritize the management of other crops. Therefore, the farmers tend to sell the cashew nuts as a commodity at minimal standards (wet-in-shell nuts and unsegregated product). The fluctuating price of cashew nuts is another factor: farmers will try to sell when the price is high, and, regardless of how ripe the product is, the cashew apples will be harvested, which then severely compromises the nut quality. The farmers looked to segregation or drying processes as alternative activities but perceived them as high-risk ventures for obtaining better prices.

The major wholesaler and exporters are the key players who manage the value addition in line with export requirements. Although this study reveals that the value orientation was also confined to a commodity-based trade, it also involved some transactional standards. The major wholesaler

was contracted to supply the cashew nuts to the exporters based on the water content, size, and weight requirements. The exporters also engaged in further action to align with the certification requirements of the international export market.

3.5 Discussions

Transforming value chains into integrated global supply chains is an extremely challenging undertaking (Gereffi et al., 2005). The proposed framework in this study provides a novel approach to assist in this endeavour with a specific focus on the common source of agrifood value chains: developing countries. This framework uses value chain mapping to provide a baseline assessment of current status (Chofreh et al., 2019; Zokaei, 2010) in preparation for identifying transformational routes. While previous studies on the value chain transformation typically recommend generic approaches to upgrading, such as process, product or governance (Gereffi et al., 2005; Kaplinsky & Morris, 2000; Pérez & Oddone, 2016), the framework here identifies tailored transformation routes based on a maturity assessment. The strengths and weaknesses of different actors' practices can be identified through the maturity assessment, which encompasses factors such as information sharing, vertical and horizontal coordination as governance indicators, and safety, quality and value orientation as value addition indicators. In doing so, the further integration that is required of each critical actor can be clearly established to achieve an aligned value chain to enhance overall value creation. This contributes to an assertion that governance and value addition are intertwined components required to leverage value chain integration. In order to gain a fuller appreciation of the value chain transformation, greater attention needs to be paid to align the maturity level practices in order to guide each actor's transformation route.

Enhancing governance often results in a significant value-addition. The value chain transformation could be accomplished by focusing on interconnecting activities that create and capture more value, as the entire networking governance competes for a successful value chain operation (FAO, 2014). In order to achieve this, the proposed framework also promotes managerial implications of value chain transformation by explicitly identifying a sequential route. The transformation route is classified into route 1 (governance focus), and route 2 (value-added focus) as illustrated in Figure 3.6. The best practice value chain integration can only be achieved if the value chain achieves the highest combination of governance and value addition practices. It is noted that although the value chain has powerful governance, the chain could lose the opportunity to serve

the best value market without adding significant value (unleveraged governance zone in Figure 3.6). Conversely, having more value-added (branded product) without sufficient governance is unfeasible as the latter cannot be generated without governance oversight. The two transformation routes will be further explored in relation to the cashew nuts case example.

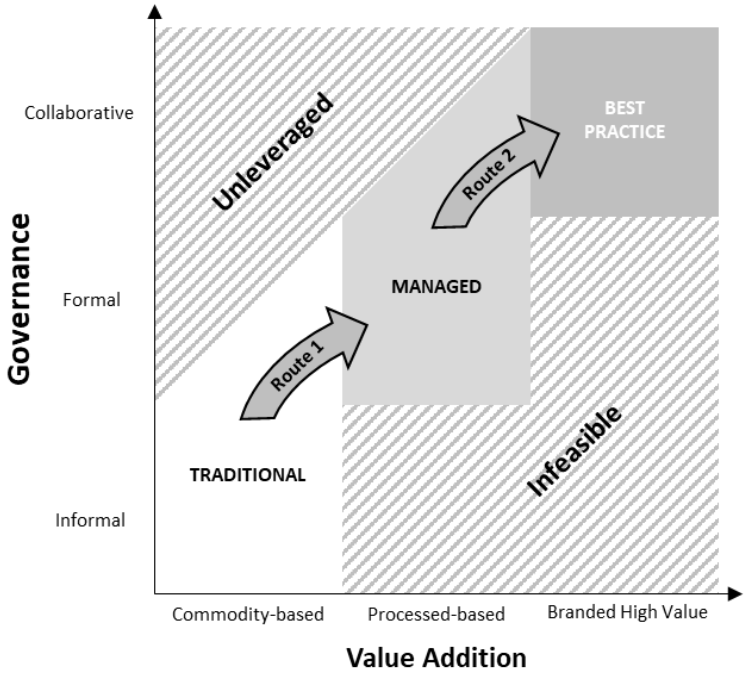


Figure 3. 6. Value chain transformation route

This empirical study on Indonesia's cashew nuts sector provides further evidence of the imbalance of power between farmers in developing countries and the export/global value chain actors (in terms of governance and value addition). In general, most of the local actors are decoupled from GVC governance (for example in the case of the cashew farmers) as they are preoccupied with traditional value chain practices. Meanwhile, the global players (key traders and exporters) have achieved a managed value chain status. The results of this study are reminiscent of the cocoa sector in Indonesia, where there is a lack of procedural fairness (Thorpe, 2018). A large volume of the cashew nuts produced in Indonesia are exported as a commodity (raw material source), which reinforces the insufficient performance of Indonesia's cashew nuts processing industry. Thus, farmers miss out on the higher value opportunity due to the commodity sales to the GVC (Thorpe, 2018) which typically do not prioritize the interests of smallholder farmers (Sjauw-Koen-Fa et al., 2018).

The maturity level assessment shows that the farmers, as the decoupled participant, perform the traditional value chain practices that are vulnerable to exploitation. While the small-scale intermediaries and other wholesalers have also been identified as traditional value chain participants, they are not a critical agent of transformation. They are minor contributors to the value chain because they add very little value to the product in their logistical role. In the context of this cashew nuts value chain case, the transformation process proposed by this study targets smallholder farmers in improving their value chain activities. Equally, it is noted that the main wholesaler and the exporters hold significant power in driving the transformation process towards a more managed value chain. However, the cooperation of these players is far from best practice management. With these considerations in mind, the following transformation routes are proposed:

- *Transformation Route 1*

Route 1 focuses on eliminating any deficient practices through governance improvement by bringing all the value chain actors into the same maturity practice. In the case of the cashew nut industry in Indonesia, this route focusses on moving the smallholder farmers, as the weak link in the value chain, into the managed chain status by developing practices to the level of the key wholesaler and exporters. In order to achieve this, assistance and incentives will be required to develop and drive improvements in practice, such as information sharing and training. Some studies (Tessmann, 2020; Thorpe, 2018) suggest that the best practice value chain involves careful facilitation and assistance with suppliers, such as technical, production and market support. Such actions could entail horizontal coordination, by farmer groups, to contribute to strengthening their collective action capacities. Collective action establishes a single entity of producers; hence, the key wholesaler and exporters could work closely with farmer groups (producer organizations) as the main source of raw cashew nuts. The cashew value focus in this transformation is to enhance the 'wet-in-shell' quality into the 'dry-in-shell' superior quality and implement segregation to enhance the price of the commodity. While this value concentration is still classified as commodity-based, the key wholesaler and exporters need to drive this value addition through incentives and price stability. Overall, the governance improvement in route 1 facilitates all critical value chain actors to practice the same maturity level structure and establishes a more collaborative chain.

- *Transformation Route 2*

The second transformation route addresses all value chain actors (the collaborative chain) to further enhance their practices from the managed chain into a best practice chain, which will require

long-term approaches and activities. Route 2 focuses on branding the high-value product to allow wider market exploration (for local markets but especially for export markets). An effective value creation and branded products would enable greater income, establish new partnerships, and attract new investors (Mili & Arfa, 2020). In this particular case, it requires a subsequent value addition into a more processed-based orientation and greater commitment to global standards, quality, and safety (Collins, 2014).

In this study's example of cashew nuts in Indonesia, the value chain actors would need to extend their contractual agreements to the long term because, as Collins (2014) argues, a binding rule leads to a total focus on consumer standard-arrangements. Russo (2016) refers to a fruit and vegetable cooperative case in Italy, where the brand is strongly related to local identities, as an example of the creation of a branded high-value product. Extrapolating from Russo's example, the cashew brand development could be addressed by establishing a strong producer organization and eco-brand cashew nuts, since farmers are using environmentally friendly farm practices. To strengthen this practice, some scholars (e.g. Chi et al., 2018) suggest that training is central to the adoption of sustainable farming practices. The branding strategy suggested by Lindgreen et al. (2013) may be applied to more processed products, which could lead to new market opportunities for the branded high-value product in developed economies such as Europe, Australia, New Zealand and the United States. As Trienekens (2011) observes, developed countries typically have higher expectations of value addition standards and systems compared to developing countries. Thus, enhanced processes and product branding will upgrade the value of the product sourced from the developing country to trade in the global market.

Value chain transformation is a complex task that requires a clear trajectory. The challenges are especially pronounced when actors along the chain engage in variable levels of practice, as with the case of the Indonesian cashew industry studied. A two-stage route is proposed to enable the transformation process. Firstly, the value chain actors should work together towards higher value products through a more formal governance structure. The second stage emphasizes a collaborative approach to enhance, capture and share value in both domestic and international markets. As Collins (2014) points out, the agrifood value chain is a system which includes the value-added domains of food safety, traceability, information systems, and quality, all of which are consumer-related and driven by technical activities and a governance subsystem. As such, a clear transformation route is

vital for the value chain actors in developing countries to contribute to greater integration and profitable involvement in global trade.

3.6 Conclusion

The novel framework developed and tested in this paper furthers understandings of the value chain transformation process by highlighting the potential of assessing the maturity of each actor (in terms of governance and value addition) to determine a tailored improvement route. The value chain maturity level construction that centred on the typical characteristics of developing countries' transformations also provided empirical insights from a case application of the cashew nut sector in Indonesia.

Although this paper presents a significant development in value chain transformation methods, more evidence is naturally required in different sectors to verify the results. The current work has limitations specifically related to the scope of the study area, the commodity, and the methodological approach employed. Obviously, the case study does not reflect the entire cashew sector in Indonesia or that of other developing countries. Additionally, the application of this paper's framework to other commodities may require additional adjustments, as the cashew nuts have specific characteristics (for example, the different qualities of the nut in its different stages of product transformation) which may be irrelevant to other commodities. Finally, the qualitative approach employed in this study may suggest different findings compared to a quantitative method. Alternative approaches have the potential to identify additional indicators and refine the novel framework that has been proposed here.

A potential follow-up study of this framework could examine the enablers and barriers of value chain transformation, especially by addressing the relevance of sustainable practices and certification. Global value chain transformation often entails not only product quality, differentiation and system efficiency, but also social-environmental standards and the associated business environment (Nutz & Sievers, 2015). Thus, exploring how to convert a value chain into a sustainable system will provide a more detailed perspectives of transformation and establish a stronger connection to current global market requirements.

References of Chapter 3

ACi. (2010). *A Value Chain Analysis of the Cashew Sector in Ghana*. Technische Zusammenarbeit GmbH (GTZ). https://agoa.info/images/documents/5130/Chashew_valuechain_analysis_Ghana.pdf

Bassett, T. J., Koné, M., & Pavlovic, N. R. (2018). Power relations and upgrading in the cashew value chain of Côte d'Ivoire. *Development and Change*, *49*(5), 1223–1247. https://doi.org/10.1111/dech.12400

Batista, L., Dora, M., Toth, J., Molnár, A., Malekpoor, H., & Kumari, S. (2019). Knowledge management for food supply chain synergies – A maturity level analysis of SME companies. *Production Planning & Control*, *30*(10–12), 995–1004. https://doi.org/10.1080/09537287.2019.1582104

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, *18*(13), 2293–2302. https://doi.org/10.1017/S136898001500021X

Bochtis, D., Sørensen, C. A. G., & Kateris, D. (2019). Agriproducts supply chain operations. In D. Bochtis, C. A. G. Sørensen, & D. D. Kateris (Eds.), *Operations Management in Agriculture* (pp. 179–186). Elsevier. https://doi.org/10.1016/B978-0-12-809786-1.00007-2

Cavagnaro, E., & Curiel, G. (2012). *The three levels of sustainability*. Greenleaf Publishing Limited. https://doi.org/10.4324/9781351277969

Chi, D. Q., Nhung, P. T. M., & Hung, L. (2018). *Strengthening practices in the Vietnamese cashew nut industry*. Research Center for Employment Relations (ERC), and Norad. https://unil.no/globalassets/vedlegg/kartleggingsstudie-cashew-vietnam-2018.pdf

Childerhouse, P., & Towill, D. R. (2006). Enabling seamless market-orientated supply chains. *International Journal of Logistics Systems and Management*, *2*(4), 357–370.

Childerhouse, P., & Towill, D. R. (2011). Arcs of supply chain integration. *International Journal of Production Research*, *49*(24), 7441–7468. https://doi.org/10.1080/00207543.2010.524259

Chofreh, A. G., Goni, F. A., Zeinalnezhad, M., Navidar, S., Shayestehzadeh, H., & Klemeš, J. J. (2019). Value chain mapping of the water and sewage treatment to contribute to sustainability. *Journal of Environmental Management*, *239*(December 2018), 38–47. https://doi.org/10.1016/j.jenvman.2019.03.023

Collins, R. (2014). Value chain management and postharvest handling. In W. J. Florkowski, R. L. Shewfelt, B. Brueckner, & S. E. Prussia (Eds.), *Postharvest handling* (pp. 123–145). Elsevier. https://doi.org/10.1016/B978-0-12-408137-6.00006-5

Cresswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed). SAGE Publications, Inc.

Dendena, B., & Corsi, S. (2014). Cashew, from seed to market: A review. *Agronomy for Sustainable Development*, *34*(4), 753–772. https://doi.org/10.1007/s13593-014-0240-7

DFID. (2008). *Making value chains work better for the poor: A toolbook for practitioners of value chain analysis*. Agricultural Development International. https://doi.org/10.1017/CBO9781107415324.004

Done, A. (2011). *Developing supply chain maturity*. IESE Business School-University of Navarra.

Donovan, J., Franzel, S., Cunha, M., Gyau, A., & Mithöfer, D. (2015). Guides for value chain development: A comparative review. *Journal of Agribusiness in Developing and Emerging Economies*, *5*(1), 2–23. https://doi.org/10.1108/JADEE-07-2013-0025

FAO. (2014). *Developing sustainable food value chains: Guiding principles. FAO*. http://www.fao.org/3/i3953e/i3953e.pdf

Fauziyah, E., Aniyatussholihah, A., & Hidayati, D. R. (2017). Strategy of export competitiveness enhancement on cashew nut commodity. *JEJAK*, *10*(2), 302–316. https://doi.org/10.15294/jejak.v10i2.11295

Garnevska, E., Liu, G., & Shadbolt, N. M. (2011). Factors for successful development of farmer cooperatives in Northwest China. *International Food and Agribusiness Management Review*, *14*(4), 16.

Gereffi, G., Humphrey, J., Kaplinsky, R., & Sturgeon, T. J. (2001). Introduction: Globalisation, value chains and development. *IDS Bulletin*, *32*(3), 1–8. https://doi.org/10.1111/j.1759-5436.2001.mp32003001.x

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

Gómez, M. I., & Ricketts, K. D. (2013). Food value chain transformations in developing countries: Selected hypotheses on nutritional implications. *Food Policy*, *42*, 139–150. https://doi.org/10.1016/j.foodpol.2013.06.010

Griffith, G., Baker, D., Fleming, E., Mounter, S., Malcolm, B., & Umberger, W. (2017). Chain failure and chain goods: Re-thinking value chain upgrading and promotion in developing countries. *International Journal on Food System Dynamics*, *8*, 146-154. https://doi.org/10.18461/IJFSD.V8I2.825

Hernández, R. A., Martínez Piva, J. M., Mulder, N., & United Nations (Eds.). (2014). *Global value chains and world trade: Prospects and challenges for Latin America*. Economic Commission for Latin America and the Caribbean (ECLAC).

Humphrey, J., & Memedovic, O. (2006). *Global value chains_in_the_agrifood_sector.* United Nations Industrial Development Organization. https://www.researchgate.net/publication/252624330_Global_Value_Chains_in_the_Agrifood_Sector/link/02e7e53b31ea5c65ae000000/download

ILO. (2016). *Value chain development for decent work: How to create employment and improve working conditions in targeted sectors* (2nd ed.). http://site.ebrary.com/id/11253011

Jadid, N., Sutikno, Dewi, D. S., Nurhidayati, T., Abdulgani, N., Muzaki, F. K., Arraniry, B. A., Mardika, R. K., & Rakhman, R. Y. (2017). Traditional pattern of cashew cultivation: A lesson from Sumenep-Madura, Indonesia. *AIP Conference Proceedings*, *1908*(1), 040005. https://doi.org/10.1063/1.5012719

Jaffee, S. M., & Henson, S. (2005). *Global Agricultural Trade and Developing Countries* (M. A. Aksoy, J. C. Beghin, & World Bank, Eds.). World Bank.

Kaplinsky, R., & Morris, M. (2000). *A handbook for value chain research*. FAO. http://www.fao.org/fileadmin/user_upload/fisheries/docs/Value_Chain_Handbool.pdf

Lahti, M., Shamsuzzoha, A. H. M., & Helo, P. (2009). Developing a maturity model for supply chain management. *International Journal of Logistics Systems and Management*, *5*(6), 654. https://doi.org/10.1504/IJLSM.2009.024796

Lee, J., Gereffi, G., & Beauvais, J. (2010). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences*, *109*(31), 12326–12331. https://doi.org/10.1073/pnas.0913714108

Lindgreen, A., Maon, F., & Vanhamme, J. (Eds.). (2013). *Sustainable value chain management: A research anthology*. Gower.

Listyati, D., & Sudjarmoko, B. (2011). Nilai tambah ekonomi pengolahan jambu mete Indonesia. *RISTRI*, *2*(2), 231–238.

Liu, Y., Eckert, C., Yannou-Le Bris, G., & Petit, G. (2019). A fuzzy decision tool to evaluate the sustainable performance of suppliers in an agrifood value chain. *Computers and Industrial Engineering*, *127*(November 2018), 196–212. https://doi.org/10.1016/j.cie.2018.12.022

Manikandan, S., Gadhe, S., & Ajmal, A. (2017). Value chain analysis of cashew processing. *Agriculture Update*, *12*(Special-3), 688–691. https://doi.org/10.15740/HAS/AU/12.TECHSEAR(3)2017/688-691

McCullough, E. B., Pingali, P. L., & Stamoulis, K. G. (2008). The transformation of agri-food systems. In *The Transformation of Agri-Food Systems*. p (3-46). FAO and Earthscan. https://doi.org/10.4324/9781849773331

Mili, S., & Arfa, I. (2020). Uncovering value creation factors in organic food supply chains. *International Journal on Food System Dynamics*, *11*, 503-521 https://doi.org/10.18461/IJFSD.V11I5.70

Miller, C., & Jones, L. (2010). *Agricultural value chain finance: Tools and lessons*. Food and Agriculture Organization of the United Nations. http://www.fao.org/3/i0846e/i0846e.pdf

Strategic Plan of Ministry of Agriculture 2015—2019, Pub. L. No. 19/Permentan/HK.140/4/2015, 1 (2015). https://www.academia.edu/30283213/RENSTRA_kementrian_pertanian_2015_2019

Ministry of Agriculture. (2017). *Tree crop estate statistics Of Indonesia 2016 -2018: Cashew nuts*. Directorate General of Estate Crops, Ministry of Agriculture. http://ditjenbun.pertanian.go.id/?publikasi=buku-publikasi-statistik-2016-2018

Ministry of Trade of Indonesia. (2014). *Analysis for excise tax implementation at raw cashew export proposal*. Ministry of Trade of Indonesia. http://bppp.kemendag.go.id/media_content/2017/08/Analisis_Usulan_Pengenaan_Bea_Keluar_Atas_Ekspor_Mete_Gelondong.pdf

Minten, B., Habte, Y., Tamru, S., & Tesfaye, A. (2020). The transforming dairy sector in Ethiopia. *PLOS ONE*, *15*(8), e0237456. https://doi.org/10.1371/journal.pone.0237456

Mishra, P. K., & Dey, K. (2018). Governance of agricultural value chains: Coordination, control And safeguarding. *Journal of Rural Studies*, *64*(October), 135–147. https://doi.org/10.1016/j.jrurstud.2018.09.020

Mitchell, J., Coles, C., & Keane, J. (2009). *Trading up: How a value chain approach can benefit the rural poor*. COPLA. https://cdn.odi.org/media/documents/5656.pdf

Monteiro, F., Catarino, L., Batista, D., Indjai, B., Duarte, M., & Romeiras, M. (2017). Cashew as a high agricultural commodity in West Africa: Insights towards sustainable production in Guinea-Bissau. *Sustainability*, *9*(9), 1666. https://doi.org/10.3390/su9091666

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Norton, R. D. (2017). *The competitiveness of tropical agriculture: A guide to competitive potential with case studies.* Elsevier. https://doi.org/10.1016/B978-0-12-805312-6.00006-4

Nutz, N., & Sievers, M. (2015). A rough Guide to Value Chain Development: How to Create Employment and Improve Working Conditions in Targeted Sector. https://www.ilo.org/empent/areas/value-chain-development-vcd/WCMS_366005/lang--en/index.htm

Pappa, I., Illiopoulos, C., & Massouras, T. (2019). On sustainability of a dairy sector in crisis. *International Journal on Food System Dynamics*, *10 (2)*, 130-150. https://doi.org/10.18461/IJFSD.V10I2.08

Pérez, R. P., & Oddone, N. (2016). *Strengthening Value Chains: A Toolkit*. IFAD. https://repositorio.cepal.org/bitstream/handle/11362/40911/1/S1700023_en.pdf

Plantation Agency of East Java Province Indonesia. (2017). *Strategic Plan of Plantation Sector Development 2015-2019*. East Java Province Government. http://disbun.jatimprov.go.id/web/assets/sakip/7d195844a58c478ffcb52e1a4e4e647a.pdf

Presidential Regulation of Republic Indonesia No 44 2016. Retrieved March 1, 2019, from http://jdih.dephub.go.id/assets/uudocs/perpres/2016/Perpres_44_tahun_2016_Daftar_Bidang_Usaha.pdf

Reardon, T. (2015). The hidden middle: The quiet revolution in the midstream of agrifood value chains in developing countries. *Oxford Review of Economic Policy*, *31*(1), 45–63. https://doi.org/10.1093/oxrep/grv011

Reardon, T., Barrett, C. B., Berdegué, J. A., & Swinnen, J. F. M. (2009). Agrifood industry transformation and small farmers in developing countries. *World Development*, *37*(11), 1717–1727. https://doi.org/10.1016/j.worlddev.2008.08.023

Reardon, T., Lu, L., & Zilberman, D. (2019). Links among innovation, food system transformation, and technology adoption, with implications for food policy: Overview of a special issue. *Food Policy*, *83*(October 2017), 285–288. https://doi.org/10.1016/j.foodpol.2017.10.003

Ros, E. (2010). Health benefits of nut consumption. *Nutrients*, *2*(7), 652–682. https://doi.org/10.3390/nu2070652

Rosman, R. (2018). Peningkatan produksi jambu mete nasional melalui perbaikan teknologi budidaya berbasis ekologi "Increasing national cashew production through improved ecology-based cultivation technology. *Perspektif*, *17*(2), 166-174. https://doi.org/10.21082/psp.v17n2.2018.166-174

Royer, A., Bijman, J., & Bitzer, V. (2016). Linking smallholder farmers to high quality food chains: Appraising institutional arrangements. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 33–62). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_2

Russo, E. (2016). Short channels: A brand Strategy for the Piana del Sele. *Agriculture and Agricultural Science Procedia*, *8*, 494–498. https://doi.org/10.1016/j.aaspro.2016.02.053

Seidel-Sterzik, H., McLaren, S., & Garnevska, E. (2018). A capability maturity model for life cycle management at the industry sector level. *Sustainability*, *10*(7), 2496. https://doi.org/10.3390/su10072496

Siddique, M. I., Garnevska, E., & Marr, N. E. (2018). Factors affecting marketing channel choice decisions of smallholder citrus growers. *Journal of Agribusiness in Developing and Emerging Economies*, *8*(3), 426–453. https://doi.org/10.1108/JADEE-03-2016-0014

Sjauw-Koen-Fa, A. R. (2012). *Framework for an inclusive food strategy: Co-operatives—A Key for smallholder inclusion into value chains*. Rabobank. https://www.researchgate.net/publication/283419481_Framework_for_an_inclusive_Food_Strategy_Co-operatives_-_a_key_for_smallholder_inclusion_into_Value_Chains

Sjauw-Koen-Fa, A. R., Blok, V., & Omta, O. S. W. F. (2018). Exploring the integration of business and CSR perspectives in smallholder souring: Black soybean in Indonesia and tomato in India. *Journal of Agribusiness in Developing and Emerging Economies*, *8*(4), 656–677. https://doi.org/10.1108/JADEE-06-2017-0064

Susanto, E. B. (2018). Eksplorasi Tanaman Jambu Mete (Annacardium occidentale L.) Pada Beberapa Daerah Sentra Di Pulau Madura). *Jurnal Produksi Tanaman*, *6*(6), 1048–1057. http://protan.studentjournal.ub.ac.id/index.php/protan/article/view/746

Tessmann, J. (2020). Global value chains and policy practice: The making of linkages in the Ivorian cashew industry. *Competition & Change*, *24*(1), 26–43. https://doi.org/10.1177/1024529419877491

Thorpe, J. (2018). Procedural justice in value chains through public–private partnerships. *World Development*, *103*, 162–175. https://doi.org/10.1016/j.worlddev.2017.10.004

Trienekens, J. H. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review*, *14*(2), 32.

Trienekens, J., van Velzen, M., Lees, N., Saunders, C., & Pascucci, S. (2018). Governance of market-oriented fresh food value chains: Export chains from New Zealand. *International Food and Agribusiness Management Review*, *21*(2), 249–268. https://doi.org/10.22434/IFAMR2017.0063

Vadivel, V., Kunyanga, C. N., & Biesalski, H. K. (2012). Health benefits of nut consumption with special reference to body weight control. *Nutrition*, *28*(11–12), 1089–1097. https://doi.org/10.1016/j.nut.2012.01.004

Widjaya, J. M., & Tanuwidjaja, G. (2017). Sustainable agro-industrial ecology concept of the Madura Island. *IOP Conference Series: Earth and Environmental Science*, *79*, 012025. https://doi.org/10.1088/1755-1315/79/1/012025

WTO. (2019). *Global value chain development report 2019: Technological innovation, supply chain trade, and workers in a globalized world*. The World Bank. https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019

Zahir, N., & Sanawiri, B. (2018). Analisis daya saing kacang mete Indonesia di pasar internasional (Studi tentang kacang mete Indonesia tahun 2011-2015). *Jurnal Administrasi Bisnis (JAB)*, *54*(1), 8. http://administrasibisnis.studentjournal.ub.ac.id/index.php/jab/article/view/2218.

Zocca, R. O., Gaspar, P. D., da Silva, P. D., Nunes, J., & de Andrade, L. P. (2018). Introduction to sustainable food production. In C. Galanakis (Ed.), *Sustainable food systems from agriculture to industry* (pp. 3–46). Elsevier. https://doi.org/10.1016/B978-0-12-811935-8.00001-9

Zokaei, K. (2010). Value chain analysis of the UK food sector. In C. Mena & G. Stevens (Eds.), *Delivering Performance in Food Supply Chains* (pp. 187–211). Elsevier. https://doi.org/10.1533/9781845697778.3.187

CHAPTER 4
Enabling sustainable agrifood value chain transformation in developing countries

This chapter provides identification and analysis of the enabling factors for a sustainable agrifood value chain transformation in developing countries. The manuscript has been published in the Journal of Cleaner Production. This is a leading journal devoted to cleaner production, environmental, and sustainability research and practice that are very much aligned to the paper. This journal is classified as Q1 journal with an impact factor of 11.072 and cite score 15.8, providing high visibility as it is also indexed by Scopus, GEOBASE, Geographical abstracts, INSPEC, etc.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2023). Enabling sustainable agrifood value chain transformation in developing countries. *Journal of Cleaner Production*. Volume 395 (Available online 11 February 2023). https://doi.org/10.1016/j.jclepro.2023.136300.

Abstract

As agrifood value chains in developing countries transform to serve higher value markets, they are coming increasingly under pressure to embrace sustainable practices. Many key players, particularly smallholders, find it difficult to comply with sustainable practice requirements. They face various barriers in the chain's operation (in terms of governance and value addition), while their primary focus is on increasing incomes to alleviate poverty. Therefore, this study empirically identifies and analysis the factors that enable sustainable value chain transformation in developing countries. A total of three key dimensions (sustainability, governance, and value addition) were used to explore the factors that enable sustainable value chain transformation. Furthermore, the existing practice as well as future intentions towards sustainable value chain practices are evaluated. A quantitative method was employed within Indonesia's cashew sector, and structured interviews were conducted with 159 smallholders from the key production area on Madura Island. The analysis was performed using a combination of descriptive and principal component analysis (PCA). A total of eight factors that enable sustainable transformation were identified. Farm practices and

information communication were identified as the most significant enabling factors, as well as stakeholder support, certification motivation, and market expansion. Conversely, the most challenging factors were pre-harvesting value, value capturing, and value adding activities. The results reveal the current practices, barriers, and enablers, and provide policy and practice insights for transforming sustainable value chains in developing countries.

Keywords: Enablers and barriers, sustainable value chains, transformation, smallholders, agrifood, developing countries

4.1 Introduction

Agrifood value chains in developing countries are transforming to service higher-value markets, which are increasingly requiring players to embrace sustainable practices. Consumers in such markets demand more processed products and consistent quality and safety standards (Filippi & Chapdaniel, 2020; Hidayati et al., 2021b; Miller & Jones, 2010; Ramos-Mejía et al., 2018). To achieve this, value chain players must amend their products and services to be more sustainable (economic, social, and environmental) (Borsellino et al., 2020; Hubeau et al., 2017; Liu et al., 2019). To improve 'value' towards sustainability expectations requires proficient governance and tailored value addition activities (Borsellino et al., 2020; Hidayati et al., 2021c).

In most developing countries, a focus on smallholders' practices serves as the foundation for value chain transformation; however, enabling sustainable practices can encounter serious barriers. Although smallholders account for the majority of raw material suppliers, they are often decoupled from chain operations, particularly in terms of governance and value addition (Hidayati et al., 2021b, 2021a; Thorpe, 2018). Furthermore, smallholders typically prioritise practice advancements that improve their income (Maspaitella et al., 2018; Ramos-Mejía et al., 2018; Sjauw-Koen-Fa et al., 2016), which may divert attention away from overall sustainability goals. This economic focus is aimed at reducing poverty, which means that socio-environmental factors receive less attention in developing countries (FAO, 2014; Hidayati et al., 2021c; Schoon et al., 2013). In particular, concentrating solely on the economic aspects of value chain transformation could result in degradation of social and environmental factors. Consequently, sustainable value chain transformation in developing countries remains a critical area of research.

Given the complex challenges in developing countries, several studies have investigated this area through a range of arguments and approaches such as identifying drivers and barriers (Borsellino et al., 2020; Gold et al., 2017; Mangla et al., 2018; Mohseni et al., 2022), upgrading activities (Larsen, 2016; Morone & Cottoni, 2016; Vroegindewey & Hodbod, 2018) and measurement techniques (FAO, 2014; Latruffe et al., 2016; Monastyrnaya et al., 2017). These studies have contributed significantly to the growth of knowledge by identifying key indicators for sustainable value chain transformation based on current transformational challenges. However, which factors should be prioritised during the sustainable transformation process remains uncertain. According to Kheiri (2015), smallholders' attitudes towards sustainable practices require further attention as they are impacted by a range of obstacles. Hidayati et al. (2021c) proposed a framework for sustainable value chain orientation trajectory customisation using a structured approach based on three dimensions: sustainability, governance, and value addition. Each dimension has the potential to either enable or obstruct sustainable transformation (Seidel-Sterzik et al., 2018). Therefore, despite the importance of these dimensions in the sustainable value chain approach, it is critical to empirically examine both current practices and intentions towards sustainable value chain practices to better understand how to enable sustainable transformation.

This study empirically identifies and analysis the factors that enable sustainable value chain transformation in developing countries. Indonesia's cashew sector was selected to obtain empirical evidence from a developing country. Approximately 99.8% of cashew producers in Indonesia are smallholders (Directorate General of Plantation, Agricultural Ministry of Indonesia, 2020). Approximately 70% of Indonesia's cashew products are sold globally in the form of a raw commodity (Hidayati et al., 2021b). Given the dominance of exports over domestic trade, Indonesia's adoption of sustainable value chain practices is unavoidable in the long term. The global supply of cashews is heavily reliant on developing countries, with Indonesia being a major player (Royer et al., 2016). The Indonesian government has recently identified the cashew sector as important for global trade (Directorate General of Plantation, Agricultural Ministry of Indonesia, 2020).

This study makes a significant contribution by identifying the factors and vectors that enable sustainable value chain transformation in developing countries based on empirical evidence. Moreover, this study can serve as a replication guide for practitioners and policymakers. The rest of this paper is structured as follows. A literature review that provides a theoretical basis for the

research is presented in section 4.2. In section 4.3, methodology is justified and the empirical approach explained. The resulting data is analysed in section 4.4. Finally, a discussion that links the results to previous research and the conclusion identify the original contribution and future research avenues are presented in sections 4.5 and 4.6, respectively.

4.2 Literature review

In recent years, there has been a growing discussion on agrifood value chains in developing countries that are transforming into higher-value markets, with sustainable practice as their main challenge. Some studies argue that the urgency of incorporating sustainability practice into agrifood value chains was fuelled by the central attention on food safety and quality (FAO, 2014; Morone & Cottoni, 2016). With respect to this, many studies have also highlighted the way food is produced in the agrifood industry, leading to an emphasis on food security and recommendations for sustainable value chain practice (Berry et al., 2015; Mohseni et al., 2022; Morone & Cottoni, 2016; Vroegindewey & Hodbod, 2018). The sustainable value chain lens is a multidisciplinary approach that combines the value chain and sustainability approaches. Such practices enable all players throughout the chain to produce and deliver high-end value via sustainability practices. At each stage of the value chain, the economic, social, and ecological dimensions are all acknowledged as beneficial (D'heur (ed.), 2015; Hidayati et al., 2021c).

Many previous studies have revealed that enabling sustainable practices in developing countries' chains is far from simple (FAO, 2014; Hansen et al., 2018; Hidayati et al., 2021c; Meybeck, 2016). Various critical challenges in developing countries have been investigated, which can be summarized as two major problems. First, as key players in agrifood value chains in many developing countries, smallholders lack capacities across a number of practices including; production, marketing, and coordination (Sjauw-Koen-Fa et al., 2016; Thorpe, 2018; Trienekens, 2011). For these reasons, they are often decoupled from downstream value chain practice especially regarding governance and value addition (Hidayati et al., 2021a, 2021b). Governance is accepted as a key activity in developing successful value chain practices (Gereffi et al., 2005; Kaplinsky & Morris, 2000; Mishra & Dey, 2018) via vertical (power allocation and integration among chain members) and horizontal coordination (collective actions) (Hidayati et al., 2021b; Trienekens, 2011). Value addition activities are equally important. Value addition is frequently defined as a set of product transformations that provides key attributes in terms of product quality and safety (Collins, 2014; Norton, 2017). Smallholders with limited governance and value addition activities

are more likely to be excluded from wider value chains. Therefore, the FAO (2014) insisted that agrifood chain development should focus on preserving smallholders in the first place.

Value chain players in developing countries generally prioritise income improvement to reduce poverty (Ramos-Mejía et al., 2018; Sjauw-Koen-Fa, 2012). However, the emphasis on income improvement in the process of value chain transformation has drawn some criticism. For instance, Morone and Cottoni (2016) highlighted that, despite economic gains, many value chain transformations contribute to environmental destruction (overexploitation of natural capital, pollution, and waste). Furthermore, Zocca et al. (2018) asserted that current agricultural problems are mainly a result of the industrial revolution. Therefore, profit-driven value chain transformations carry high-risk operations regarding sustainability. These risks are exacerbated because farming is heavily reliant on natural capital and is the source of raw materials and value-adding basis for subsequent stages (Nastis et al., 2019).

A wide range of factors have been postulated to enable sustainable agrifood value chain transformation in developing countries, as outlined in Table 4.1. Previous research can be categorised into information communication, institutional, government, facilitation, and market factors (Hidayati et al., 2021b; Thorpe, 2018; Trienekens, 2011). In addition, certification and attitudes/behaviour are critical factors that signify sustainable practice transformation in the agrifood sector. Certification is a mandatory standard of practice in sustainability (Schoneveld et al., 2019), and is closely related to control over intellectual property (Humphrey, 2006). Attitude reflects individual intentions towards sustainable practices (Hansson et al., 2019). While current practice demonstrates how individuals behave and act in actual activities, intention may imply a signal of expectation towards change. Attitude is determined by the individual's behavioural beliefs, which is the subjective probability that a particular action will result in a specific outcome (Hansson et al., 2019). This attitude may also include individual perceptions towards risks (Nastis et al., 2019). Hence, understanding actors' attitudes may serve as fundamental in understanding the key enabling factors towards sustainable practice transformation, especially as a major constraint in embracing such practice by smallholders are often attitudinal, such as being reluctant to change (Kheiri, 2015).

Table 4. 1. Enabling sustainable agrifood value chain transformation factors

Key Indicators	Description	Method	Sources
Attitude/ Behaviour	Behaviour motivates individual actors to adopt the sustainable practice	Psychometric and qualitative	Hansson et al. (2019)
		Descriptive and correlational design	Kheiri (2015)
		Risk perception (mean analysis)	Nastis et al., (2019)
		Qualitative study	Silva & Figueiredo (2020)
		Principal component analysis and spearman analysis	Béné et al.,(2020)
Information-Communication	Symmetrical information and communication will encourage actors to improve sustainable practice and capture more value	Multi-level perspective with systematic review	El Bilali & Allahyari (2018)
		Supply Chain Operation Reference model	Idowu & Schmidpeter (2015)
		Case study	Mishra & Dey, (2018)
Institution	The institution helps the actors in the collective actions, such as proceeding with contractual arrangement	Supply-demand analysis	Filippi & Chapdaniel (2020)
		Case study	Grwambi et al., (2016)
		Qualitative	Larsen (2016)
Government Role	Regulation and intervention of government provide fundamental task and ability to adopt sustainability practice	Case study	FAO (2014)
		ISM - fuzzy DEMATEL	Mangla et al., (2018)
		Multi-level perspective	Morone & Cottoni, (2016)
		PCA, ISM, DEMATEL	Paul et al., (2022)
Facilitation (including training and incentivization)	Facilitation in various forms, including training and incentives, help the actors to escalate sustainable practice	Systematic review	Borsellino et al., (2020)
		Case study	Grwambi et al., (2016)
		PCA	Joshi et al., (2020)
Markets	Access to sustainable markets encourages participation in sustainability practice and provides a better opportunity	Systematic review	Borsellino et al. (2020)
		Qualitative	Gold et al. (2017)
Certification	Certification provides standard practice compliance in sustainability	Framework development	Hidayati et al., (2021c)
		Cluster analysis	Schoneveld et al., (2019)
		Mixed method	Deka (2022)

In addition to the indicators listed in Table 4.1, enabling sustainable transformation may require further investigation to identify the priorities for transformation. Successful value chain practice advancement requires structure (Griffith et al., 2017) and the integration of actions (Childerhouse & Towill, 2011). Some studies offer practical guidelines for structuring the development of sustainable value chains. FAO (2014) proposes three steps (measuring, understanding, and improving performance). Pérez and Oddone (2016) and Monastyrnaya et al. (2017) introduced the structure through identification of current practice bottleneck/problem, followed by improvement plans. However, these methods still leave significant room for interpretation as to which factors are considered influential in leading the transformation process. Hidayati et al. (2021c) proposed a

structured approach comprised of an escalation of orientation towards the sustainable value chain through three critical dimensions in developing countries (sustainability, governance, and value addition). The sustainability dimension seeks to strike a balance between economic profit and socially engaged and environmentally friendly practices. Next, the governance dimension strives to develop an integrated and collaborative multi-level value sharing system, starting at the smallholders' level, progressing towards the value chain level, and finally to include broader stakeholders. Finally, the value addition dimension focuses on products with a high value creation orientation, which frequently shifts from commodity-based to processed-based and branded-certified product orientation. A structured approach to sustainability via governance and value addition provides a solid foundation to determine activity priorities during sustainable value chain transformation.

There is no single or common universal method or indicator to assist with sustainable agrifood value chain transformation. Diazabakana et al. (2014) stated that whether the nature of the research is quantitative or qualitative, indicators assist users in making decisions, building agenda, and creating models to provide information for society and policymakers, share knowledge, and build consensus among stakeholders. However, to provide a more structured approach, principal component analysis (PCA) is an exploratory analysis approach that seeks to condense a large number of data points into a smaller dataset with minimal information loss to identify and define the core constructs/dimensions that underpin the original variables (Hair, et al., 2019; Taherdoost et al., 2020). PCA has previously been beneficial for identifying critical factors in supply chain sustainability (Paul et al., 2022).

4.3 Methodology

A quantitative survey methodology was used to achieve the research agenda. The quantitative approach is capable of condensing data to see the big picture by measuring objective facts and focusing on the most reliable variables (Neuman, 2014). The Sumenep Regency of Madura Island was chosen as the survey area because it is one of the key cashew producing regions and was a recipient of 'the cashew belt' programme support for intensifying cashew planting. The region is located close to export-import facilities in Surabaya, as illustrated in Figure 4.1. The six main cashew subdistricts within the Sumenep Regency were targeted for this study (Dasuk, Manding, Gapura, Batuputih, Lenteng, and Rubaru) as they are the main producing areas. These sub-districts

were chosen based on the statistical data provided by the local government and in consultation with the extension officers. A total of 159 cashew smallholders were surveyed through structured interviews from June to September 2021. PCA requires a minimum of 100 data points (Taherdoost et al., 2020). Purposive sampling was used to ensure that the particulars of the respondents aligned with the study criteria (Neuman, 2014); smallholders with at least ten cashew trees who have been harvesting cashews for at least two years. Face-to-face interviews were conducted under strict Covid pandemic protocols.

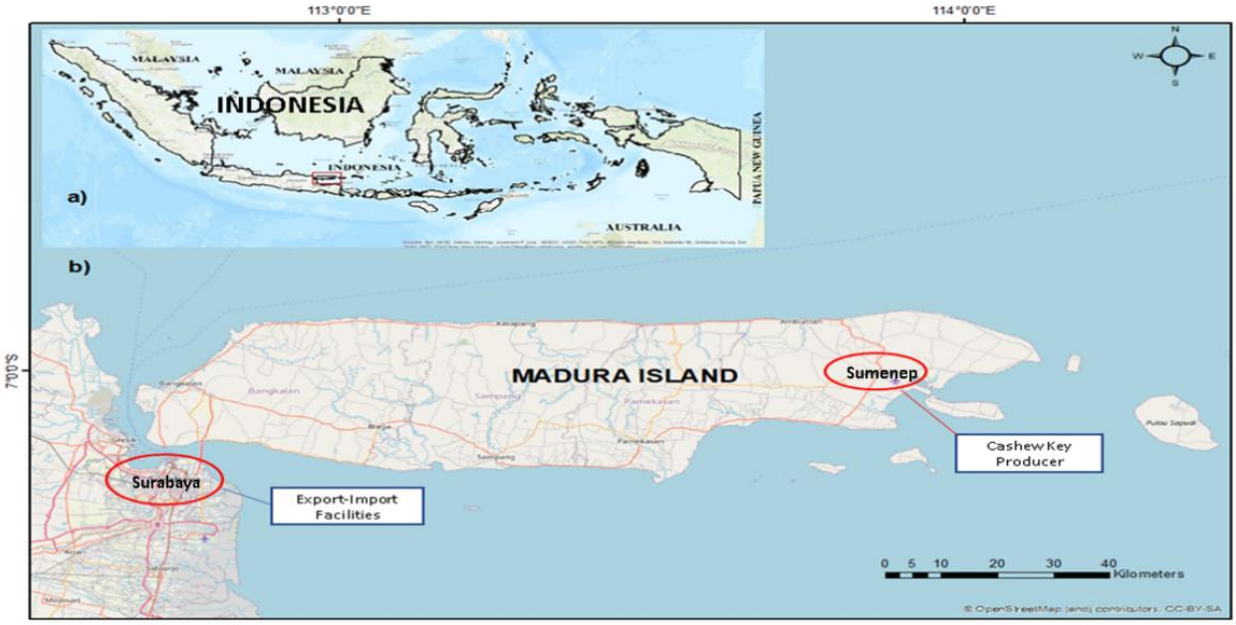


Figure 4. 1. Study Area: a) Indonesia, b) Madura Island

In line with the research agenda, a data collection instrument was developed that incorporated questions about sustainability, governance, and value addition. The data also incorporated the demographic characteristics of smallholders (i.e., age, gender, education, experience, farm typology), their current practices, and their intention towards transformation in terms of production, marketing, certifications, and coordination (with other farmers and with other stakeholders) activities. The data of intention towards sustainable value chain was collected using a five-point Likert scale (1- Strongly Disagree, 2: Disagree, 3: Undecisive, 4: Agree, 5: Strongly Agree), the specific activities are listed in Appendix C1.

SPSS statistical software was used to conduct PCA and descriptive analysis. The latter was used to analyse the respondents' characteristics, current practices, and orientations towards sustainable transformation. Descriptive analysis illustrates the samples/variables in the study

(Cresswell, 2014) via frequency distributions, measurements of central tendency, and standard deviation. For a five-point Likert scale, a standard deviation of less than 2.5 is required to test the influence of variables (Mutingi et al., 2017).

A series of tests are required to conduct PCA. The Likert-based scale analysis requires a Cronbach alpha test in order to determine the reliability (exceed 0.7 for the exploratory approach) (Hair, et al., 2019). Next, Kaiser-Meyer-Olkin (KMO) (above 0.70 is acceptable; over 0.8, meritorious and over 0.9, marvellous) was used to check the sampling adequacy (Watkins, 2018). This was followed by the Bartlett test, with a significant ($p<.05$) suitable for PCA (Taherdoost et al., 2020). After the test results are confirmed, the eigenvalues produced are used to estimate the number of components (Hair, et al., 2019; Watkins, 2018). For interpretation, only component structures with eigenvalues greater than one should be retained (Taherdoost et al., 2020) and importantly, a component should also have at least two variables (Taherdoost et al., 2020; Williams et al., 2010). A value of 0.45 is used as a guideline for identifying substantial factor loading of variables, which is suitable for a sample size of around 150 (Hair, et al., 2019). According to Hair et al. (2019), interpretation will need a strong foundation on the theoretical concept to successfully anticipate the established components and their rationale, requiring the researcher to make subjective decisions on the number of factors to extract, how to select the groupings, and the adequacy of relationships in justifying grouping variables.

4.4 Findings

The findings are presented in three parts: an overview of the sample, analysis of sustainable value chain components, and assessment of the intention towards sustainable value chains.

4.4.1 Sample overview

An overview of the survey is provided through respondents' characteristics and their current practices that are relevant to value chain activities. The overview of sample characteristics is focused on the demographic and typology description of cashew farms contained in Table 4.2.

Table 4. 2.Survey respondents' characteristics

Demographic Variables	Categories	Percentage
Age	17-35 years	23
	>35-60 years	55
	Over 60 years	23
Gender	Male	38
	Female	62
Education	No education/Not finished primary school	41
	Primary School	39
	Junior High School	8
	Senior High School	9
	Tertiary	3
Experience	± 2-5 years	8
	>5-10 years	10
	Over 10 years	82
Farm Typology		
Cashew Farm Arrangement	Single cashew farm (single crop)	37
	Mixed farming (hedgerow arrangement)	64
Cashew Trees Type Arrangement	Inherited Cashew Trees	64
	Self-Cultivation Cashew Trees	26
	Combination (including government grant tree)	10

Overall, the data in Table 4.2 indicate that most respondents are aged 35 to 60, and women play a crucial role in the cashew sector. Education levels are generally at a low-level; conversely, most respondents have over a decade of experience in cashew farming. Regarding farm typology, most are small-scale inheritance cashew farming that typically apply mixed farming to their land to generate additional income. To do so, they planted cashew trees as hedgerows and allocated open farm areas for other seasonal crops (i.e. corn and paddy). On the other hand, farm size does not reflect cashew tree ownership in the study area. The average number of trees owned by smallholders is 32, most of which are hereditary rather than self-planted or government-grant trees. The production of these cashew trees varies, and the average productivity of the inherited trees is 13 kg, while the maximum is 80 kg. Meanwhile, the average productivity of self-planted trees and government-grant trees is roughly similar at approximately 16 kg. However, self-planted trees may produce up to 69 kg, while government-grant trees produce up to 50 kg. The diverse management practices used on cashew farms seem to result in large production disparities and varying yields.

The respondents' current practices are presented in five areas: cashew production, marketing, certification, and coordination (with other smallholders and stakeholders), as summarised in Table 4.3 (see details in Appendix B). Weeding, fertilisation, pruning, and harvesting are the most

common production operations. Meanwhile, the majority of smallholders neglected rejuvenation and did not control pests or diseases on their farms. Smallholders are heavily reliant on themselves and their main family members as workers.

Table 4. 3. Current value chain practices

Elements	Summary of Current Practice
Production	Over 50% smallholders have practiced weeding, fertilizing, pruning, harvesting, and over 40% maintain hedgerow agreements Less than 30% of smallholders applied pest disease control and rejuvenation
Marketing	Over 50% smallholders have practiced: - Selling 'dry in-shell' nuts - No grading activities - Small-scale intermediaries reliant - Selling to different buyers - Searching and sharing price information - No negotiation (Price takers) - Supporting community-neighbourhood farmers
Coordination between smallholders	68% were non- members of farmer groups
Coordination with stakeholders	97% limited coordination with stakeholders
Certifications	100% were uncertified

Note: Details of frequency distribution results are presented in Appendix C2

Most of the cashew products were sold as 'dry in-shell' nuts, whilst most smallholders did not grade their cashew products, preferring small-scale intermediaries as their buyers. They want to obtain a better price and be more flexible in terms of selling. Several respondents preferred to sell their cashew nuts to a regular buyer as they were more familiar or had good relationships, resulting in higher prices and reduced gaming. Nonetheless, smallholders would still generally seek price information to sell their cashew nuts and are likely to share their information with neighbourhood farmers. However, smallholders are typically price takers. None of the respondents had any form of certification for cashew farming or products. Many smallholders lack information and are unaware of the importance of certification. Some respondents also believed that this was not beneficial for them because they were already making a profit from their regular activities.

Only a small majority of the farmers are members of farmer groups. This information implies that smallholders generally do not work collectively on activities such as cashew production or marketing. Smallholders are not part of a farmer group for various reasons, such as limited time, no interest in joining, no available farmer group in their area, withdrawal from the farmer group due to previous issues (i.e. deceitful leaders), being too old, and not knowing how to join the farmer group.

Of the third of respondents who are members, these cooperative activities were relatively irrelevant to cashew farming activities; rather, their focus was on seasonal crop practices. The vast majority of smallholders have little or no coordination with stakeholders (either the government or NGO).

4.4.2 Sustainable value chain practice

Understanding smallholders' characteristics and their current practices at the farm stage is a good starting point, but it is critical to further identify the components of sustainable value chain transformation through their intentions towards future practices, as summarised in Table 4.4. Initially, data on intention towards sustainable value chain practice were analysed using means and standard deviations (see Appendix C3). The mean analysis indicated that most of the variables signify a positive sustainable transformation, while a few variables impede sustainable transformation. The overall standard deviation was less than 2.5, indicating that the data are well-distributed around the means and hence, suitable for use as indicators. However, these results are insufficient in terms of providing a clear picture of the key factors that enable sustainable transformation.

A structured approach is required to explore how the variables fit into a transformational group of activities. Thus, PCA was utilised to synthesise factors that enable sustainable value chain practices. A series of preliminary reliability and validity tests were conducted (see Appendix C4). The Cronbach's alpha is 0.92 (higher than 0.7), indicating that the data are highly reliable, the KMO result is 0.84, demonstrating that the sample size is more than sufficient for PCA. Next, the Bartlett test is 0.00 (less than 0.05), indicating there are a sufficient number of correlations between variables to proceed with the PCA. A total of eight components in Table 4.4 were identified based on an eigenvalue greater than 1, at least two variables loaded as a component, and factor loadings ≥ 0.45 (see Appendix C4). From these components, the total variance accumulated in the rotated factors is 57%. Total variance with a 50-60% solution is commonly considered sufficient in the social sciences, where information is generally less accurate (Hair, et al., 2019; Williams et al., 2010).

Table 4. 4. Sustainable value chain practice components in Sumenep Regency's cashew sector

Components	Variables	Loading	Description
Farm Practice Milieu	Manure application Loan for neighbours Pesticide application Chemical fertilizer application Better family lifestyle Neighbourhood helping in marketing activities Herbicide application Digital tool use in information-communication Modern tools investment for cashew harvesting Modern tools investment for cashew cultivation Financial support Rejuvenation by using own seeds Better payment to employees Non-family members employment	PC1 14.3%	Most of the variables in this component reflect smallholders' intention to improve farm production practice.
Stakeholder Support	Training support in cashew marketing Training support in cashew processing Training support in cashew production Processing tool subsidy support Input subsidy support Maintain/join membership of farmer group Support of certification training Expert support	PC2 11.7%	These variables reflect smallholders' intention to access critical facilitations from stakeholders to develop their practice.
Certification Motivation	Support of simple procedure certification Support of certification information Support of certification financial Charity allocation from income contribution	PC3 7.3%	This component mainly relates to smallholders' intention to obtain certification.
Market Expansion	New buyers' finding New buyers' connection support	PC4 5.4%	These relate to smallholders' intention to develop their cashew market.
Pre-Harvesting Value	Harvesting ripe nuts Cone harvesting method application Regular pruning after harvesting Hedgerow agreement with neighbourhood farms	PC5 5.0%	Smallholders' intention to improve the cashew nuts quality at the farmgate make up most of the variables in this component.
Information-Communication	Broader information sharing Broader information searching Manual weeding	PC6 4.7%	These variables mainly focus on information searching and sharing.
Value Adding Products	Cashew nuts unshelling Ready-to-eat product processing	PC7 4.7%	Smallholders' intention to increase cashew nuts value is the focus.
Value Capturing	Cashew nuts grading Fixed-price contract consideration Cashew nut price negotiation	PC8 4.3%	Smallholders' intention to capture more value by grading their products, negotiating price, and contracting.

4.4.3 Intention towards sustainable value chain practice

To discern the direction of smallholders' intention towards future practice, the components of sustainable value chain practice need to be further organised, as illustrated in Figure 4.2. Each component has factor loadings that operate as Constanta in the model (Jolliffe, 2002), making it easier to assess the average mean score of the component (detailed analysis is presented in Appendix C5). According to Figure 4.2, the majority of component scores are in the range of 3 to 4, indicating that respondents are generally positive towards sustainable value chain practices. With a score approaching 4, the three leading components are Information-Communication (PC6), Market Expansion (PC4) and Certification Motivation (PC3). These are followed by Stakeholder Support (PC2) and Farm Practice Milieu (PC1), with an average score statistically significantly higher than 3. Pre-harvesting Value (PC5) has a score of around 3, suggesting that the component is in somewhat of an indecisive state. Importantly, the last two components need to be highlighted. The Value Capturing (PC8) and Value Adding Products (PC7) are noted as lower than 3, indicating a lack of future practice intention. The overall score is far from the optimal level of 5 to fully enable advancement towards long-term sustainable value chain practice.

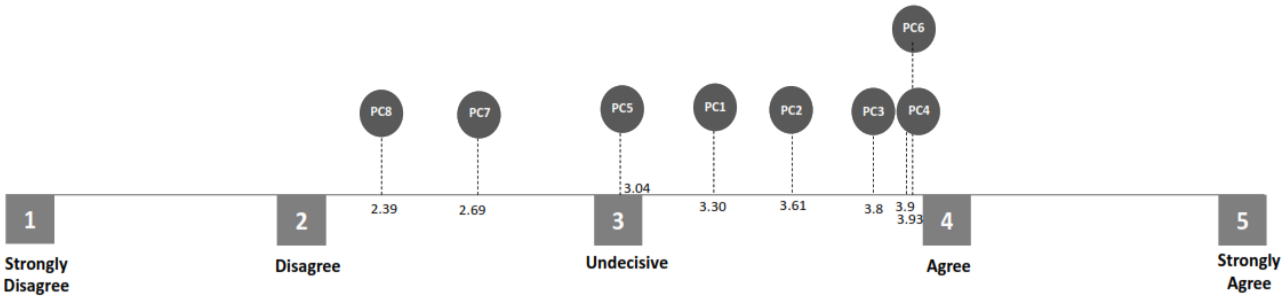


Figure 4. 2. Sustainable value chain transformation trajectory

4.5 Discussion

There is a growing interest in exploring how to enable sustainable agrifood value chain transformation. Many studies emphasise the importance of smallholders as critical players for this transformation in developing countries. Rather than providing other variables to proceed with transformation, this study contributes to synthesizing these factors to enable such transformation. Smallholders' current practices and their intention towards sustainable value chains were empirically examined Indonesia's cashew sector.

The empirical findings indicate that the current value chain practices of cashew smallholders are generally immature. However, they have a positive future intention towards sustainable value chain practices. These results provide a different perspective on sustainable transformation in developing countries compared with existing studies. Previous studies assert that a poverty reduction agenda prompts players in developing countries to advance their practices by primarily focusing on economic profit (FAO, 2014; Ramos-Mejía et al., 2018); therefore, they often overlook other aspects of sustainability (Hidayati et al., 2021c; Schoon et al., 2013). Recognising the gaps between current and intended practice enables the development of a method for prioritising factors that will guide the process of sustainable value chain transformation. A summary of current and intended practices across eight principal components of value chain sustainability is provided in Table 4.5.

How influential a factor is in enabling sustainable value chain transformation is revealed in Table 4.5. The farm practice milieu and information-communication are the most advanced sustainable value chain transformation factors. Smallholders have demonstrated a relatively mature sustainability practice in terms of social and environmental activities through their local-cultural farming activities. Thus, highlighting sustainability practice in developing countries can be based on traditional and cultural means. Transformation towards high value markets increases incomes (Maspaitella et al., 2018; Tray et al., 2021); however, this study argues that sustainable value chain transformation should also maintain some traditional practices as additional value could be created through sustainably produced products.

Table 4. 5. Current and intended practice towards sustainable value chain transformation

Components	**Current Practice**	**Intention Towards Sustainability**
Farm Practice Milieu	***	***
Information-Communication	***	***
Market Expansion	*	***
Certification Motivation	*	***
Stakeholder Support	*	***
Pre-Harvesting Value	*	**
Value Capturing	*	*
Value Adding Products	*	*

Key: *Practice*: * immature, ** average, ***mature. *Intention*: * unmotivated, ** neutral, *** motivated.

Market expansion, stakeholder support, and certification motivation are secondary factors that enable sustainable value chain transformation. These results confirm Schoneveld et al.'s (2019) argument that smallholders are less likely to participate in certification and progress to sustainable markets without support (i.e. training and incentives) and market access. Governance plays a central role in developing certification activities. Integrating smallholders and stakeholders (especially the government) is critical, whilst farmer groups play an important role in horizontal coordination. Although these activities may require long-term intervention, many scholars have observed that government assistance is typically in the form of project-based temporary activities (Hidayati et al., 2021c; Schneemann & Vredeveld, 2015; Sjauw-Koen-Fa et al., 2016).

Pre-harvesting value, value capture, and value-adding products were identified as the most challenging factors in sustainable value chain transformation. This is a common problem in many developing countries, as food is typically considered a commodity rather than containing value-added processes and activities (Lindgreen et al., 2013). However, a lack of value addition activities may not only constraint a value chain from moving into a more sustainable state but also restrict smallholders to the lowest profit segments of the chain. Since both current practice and intention towards value delivery activities are low in our study, further investigation of these factors is needed to fully enable sustainable value chains in developing countries.

This study sheds further light on the factors that enable sustainable agrifood value chain transformation in developing countries. As Mangla et al. (2018) suggested, developing a structural model to analyse enablers within the contextual relationship is critical to better support sustainable practice implementation. Our research has also provided a crucial lens of smallholders' initiatives in unveiling which activities need urgent action and which parts require further exploration. Previous studies suggest that, to compete in the market, smallholders should strategically focus on production improvement (Chiamjinnawat & Garnevska, 2018; Maspaitella et al., 2018). However, this strategy is likely to be precarious in terms of the sustainable value chain context. Smallholders often start by improving farm productivity by using more chemicals (i.e. fertilizer, pesticides, and herbicides) (Siddique et al., 2018). Therefore, rather than focusing on production, this study proposes a greater insight by maintaining the current indigenous-sustainable traditional farm practices, focusing on sensing the sustainable market and exploring value delivery activities. As Borsellino et al. (2020) postulate, research development must focus not only on enhancing basic

knowledge and recognising opportunities but also on designing meaningful actions that encourage transition towards sustainability practices within the markets.

For practitioners, particularly those in the cashew sector, this study can serve as a foundational understanding of the mechanism as well as a roadmap for moving value chains into more sustainable practices. As Silva and Figueiredo (2020) note, it is vital to recognise supply chain echelons practices to strengthen sustainability practices for responsible chain businesses. The findings allow key chain players to assess what type of support is required by cashew farmers (as suppliers), and what initiatives are needed to help with sustainable value chain improvements. Farmer-focused interventions should be supplemented with value chain-focused initiatives (Schoneveld et al., 2019). However, integration of smallholders with the rest of the value chain requires attention. Despite the fact that integration enhances the performance of every chain, the right level of market orientation may be far more varied (Childerhouse & Towill, 2006). Therefore, intervening in smallholders' practice improvement critically involves policymakers and the public sector. This study contributes to clarifying which important activities should be addressed in the short- and long-term to enable sustainable value chains. Some areas will necessitate the most intense assistance, while others will necessitate the participation of other players. To avoid cross-purposes among value chain actors and be coherent with the government policy framework, governance of the chain is critical (Vroegindewey & Hodbod, 2018).

4.6 Conclusion

This study contributes to the identification and analysis of the factors that enable sustainable value chain transformation in developing countries. A total of eight factors were identified and subsequently analysed. The results prioritise a combination of farm practice milieu and information communication factors. The next step is to extract the coalescence of factors, such as market expansion, stakeholder support, and certification motivation. Finally, the transformation challenge lies in value delivery activities by elevating enhancing pre-harvesting value, value capturing, and value-adding products. These prioritised factors lay the foundation for an effective sustainable value chain transformation pathway that provides clear guidance for users (practitioners and policymakers).

Although this study has advanced our knowledge of enabling sustainable value chain transformation, further research is required to address the limitations and explore new avenues. The cashew sector may have unique features that are different from other agrifood commodities, such as perishability, processing, and value adding. Second, the case study location may not accurately reflect the overall situation in Indonesia or other developing countries. Further larger scale research will aid in obtaining more representative results in the context of developing countries. In addition, another method could potentially be used in the research, such as a qualitative method to unpack causality and change mechanisms. Finally, since this study highlights smallholders in general, further research is required to categorise sustainable practice intentions based on smallholders' socioeconomic heterogeneity. Another possible avenue is to broaden the smallholder centric lens by including a wider set of value chain actors.

References of Chapter 4

Béné, C., Fanzo, J., Prager, S. D., Achicanoy, H. A., Mapes, B. R., Alvarez Toro, P., & Bonilla Cedrez, C. (2020). Global drivers of food system (un)sustainability: A multi-country correlation analysis. *PLOS ONE*, *15*(4), e0231071. https://doi.org/10.1371/journal.pone.0231071

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, *18*(13), 1–10. https://doi.org/10.1017/S136898001500021X

Berti, G., & Mulligan, C. (2016). Competitiveness of Small Farms and Innovative Food Supply Chains: The Role of Food Hubs in Creating Sustainable Regional and Local Food Systems. *Sustainability*, *8*(7), 616. https://doi.org/10.3390/su8070616

Borsellino, V., Schimmenti, E., & El Bilali, H. (2020). Agri-Food Markets towards Sustainable Patterns. *Sustainability*, *12*(6), 2193. https://doi.org/10.3390/su12062193

Chiamjinnawat, B., & Garnevska, E. (2018). *Effects of Farmers' Goals on Strategic Marketing Decisions: A Study of Fruit Farmers in Chanthaburi Province of Thailand*. *1*(1), 15. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3185362

Childerhouse, P., & Towill, D. R. (2006). Enabling Seamless Market-Orientated Supply Chains. *Int. J. Logistics Systems and Management*, *2*(4), 357–370.

Childerhouse, P., & Towill, D. R. (2011). Arcs of supply chain integration. *International Journal of Production Research*, *49*(24), 7441–7468. https://doi.org/10.1080/00207543.2010.524259

Collins, R. (2014). Value Chain Management and Postharvest Handling. In *Postharvest Handling* (pp. 123–145). Elsevier. https://doi.org/10.1016/B978-0-12-408137-6.00006-5

Cresswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed). SAGE Publications, Inc.

D'heur (ed.). (2015). Sustainable Value Chain Management: Delivering Sustainability Through the Core Business. In M. D'heur (Ed.), *Switzerland: Springer International Publishing*. Springer International Publishing. https://doi.org/DOI 10.1007/978-3-319-12142-0_2

Diazabakana, A., Latruffe, L., Bockstaller, C., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2014). *A review of Farm Level Indicators of Sustainability with a Focus on CAP and FADN* (p. 101).

Directorate General of Plantation, Agricultural Ministry of Indonesia. (2020). *Strategic Plan: DIrectorate General of Plantation, Agricultural Ministry of Indonesia 2020-2024*. Directorate General of Plantation, Agricultural Ministry of Indonesia. https://ditjenbun-ppid.pertanian.go.id/doc/16/RENSTRA_Ditjen%20Perkebunan%202020-2024.pdf

El Bilali, H., & Allahyari, M. S. (2018). Transition Towards Sustainability in Agriculture and Food Systems: Role of Information and Communication Technologies. *Information Processing in Agriculture*, *5*(4), 456–464. https://doi.org/10.1016/j.inpa.2018.06.006

FAO. (2014). *Developing sustainable food value chains: Guiding principles*. FAO. http://www.fao.org/3/i3953e/i3953e.pdf

Filippi, M., & Chapdaniel, A. (2020). Sustainable demand-supply chain: An innovative approach for improving sustainability in agrifood chains. *International Food and Agribusiness Management Review*, 1–16. https://doi.org/10.22434/IFAMR2019.0195

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

Gold, S., Kunz, N., & Reiner, G. (2017). Sustainable Global Agrifood Supply Chains: Exploring the Barriers: Sustainable Agrifood Supply Chains. *Journal of Industrial Ecology*, *21*(2), 249–260. https://doi.org/10.1111/jiec.12440

Griffith, G., Baker, D., Fleming, E., Mounter, S., Malcolm, B., & Umberger, W. (2017). Chain failure and chain goods: Re-thinking value chain upgrading and promotion in developing countries. *International Journal on Food System Dynamics, Vol 8*(2), 146-154 Pages. https://doi.org/10.18461/IJFSD.V8I2.825

Grwambi, B., Ingenbleek, P., Obi, A., Schipper, R. A., & van Trijp, H. C. M. (2016). 8. Towards achieving sustainable market access by South African smallholder deciduous fruit producers: The road ahead. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 161–186). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_8

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (Eighth edition). Cengage.

Hansen, U. E., Nygaard, I., Romijn, H., Wieczorek, A., Kamp, L. M., & Klerkx, L. (2018). Sustainability Transitions in Developing Countries: Stocktaking, New Contributions and a Research Agenda. *Environmental Science & Policy*, *84*, 198–203. https://doi.org/10.1016/j.envsci.2017.11.009

Hansson, H., Thompson, B., Manevska, G., Toma, L., Leduc, G., & Vranken, L. (2019). *Drivers of Farmers' Up-Take of Ecological Approaches – A Conceptual Framework with a Behavioural Focus*. 54.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021a). Agrifood value chain assessment in developing countries: A case of Indonesia's cashew sector. *E3S Web of Conferences*, *306*, 02045. https://doi.org/10.1051/e3sconf/202130602045

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021b). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/96/1073

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021c). Sustainable Agrifood Value Chain—Transformation in Developing Countries. *Sustainability*, *13*(22), 12358. https://doi.org/10.3390/su132212358

Hubeau, M., Marchand, F., Coteur, I., Mondelaers, K., Debruyne, L., & Van Huylenbroeck, G. (2017). A new agri-food systems sustainability approach to identify shared transformation pathways towards sustainability. *Ecological Economics*, *131*, 52–63. https://doi.org/10.1016/j.ecolecon.2016.08.019

Humphrey, J. (2006). Global Value Chains in The Agrifood Sector. In *International Trade and Food Security* (Issue January 2006). https://doi.org/10.4337/9781785361890.00011

Idowu, S. O., & Schmidpeter, R. ´ (Eds.). (2015). *Sustainable Value Chain Management: Value Creation as a Basis for Profitable Growth*. Springer Berlin Heidelberg.

Jolliffe, I. T. (2002). *Principal Component Analysis, Second Edition* (Second). Springer. http://cda.psych.uiuc.edu/statistical_learning_course/Jolliffe%20I.%20Principal%20Component%20Analysis%20(2ed.,%20Springer,%202002)(518s)_MVsa_.pdf

Joshi, S., Singh, R. K., & Sharma, M. (2020). Sustainable Agri-food Supply Chain Practices: Few Empirical Evidences from a Developing Economy. *Global Business Review*, 097215092090701. https://doi.org/10.1177/0972150920907014

Kaplinsky, R., & Morris, M. (2000). *A handbook for value chain research*. 113. http://www.fao.org/fileadmin/user_upload/fisheries/docs/Value_Chain_Handbool.pdf

Kheiri, S. (2015). Identifying the Barriers of Sustainable Agriculture Adoption by Wheat Farmers in Takestan, Iran. *International Journal of Agricultural Management and Development*, *5*(3), 159. https://doi.org/10.5455/ijamd.175275

Larsen, M. (2016). Sustaining Upgrading in Agricultural Value Chains? State-Led Value Chain Interventions and Emerging Bifurcation of the South Indian Smallholder Tea Sector. *Sustainability*, *8*(11), 1102. https://doi.org/10.3390/su8111102

Latruffe, L., Diazabakana, A., Bockstaller, C., Desjeux, Y., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2016). Measurement of Sustainability in Agriculture: A Review of Indicators. *Studies in Agricultural Economics*, *118*(3), 123–130. https://doi.org/10.7896/j.1624

Lindgreen, A., Maon, F., & Vanhamme, J. (Eds.). (2013). *Sustainable value chain management: A research anthology*. Gower.

Liu, Y., Eckert, C., Yannou-Le Bris, G., & Petit, G. (2019). A fuzzy decision tool to evaluate the sustainable performance of suppliers in an agrifood value chain. *Computers and Industrial Engineering*, *127*(November 2018), 196–212. https://doi.org/10.1016/j.cie.2018.12.022

Mangla, S. K., Luthra, S., Rich, N., Kumar, D., Rana, N. P., & Dwivedi, Y. K. (2018). Enablers to Implement Sustainable Initiatives in Agri-Food Supply Chains. *International Journal of Production Economics*, *203*, 379–393. https://doi.org/10.1016/j.ijpe.2018.07.012

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: A case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, *21*(1), 73–88. https://doi.org/10.22434/IFAMR2017.0011

Meybeck, A. (2016). Concluding Remarks: Sustainability in Food Value Chains: How to Get There? In A. Meybeck & S. Redfern (Eds.), *Sustainable Value Chains for Sustainable Food Systems*. Food and Agriculture Organization of the United Nations.

Miller, C., & Jones, L. (2010). Agricultural Value Chain Finance. In *FAO*. FAO, Practical Action Publishing. https://doi.org/10.1177/097639961200300108

Mishra, P. K., & Dey, K. (2018). Governance of agricultural value chains: Coordination, control and safeguarding. *Journal of Rural Studies*, *64*, 135–147. https://doi.org/10.1016/j.jrurstud.2018.09.020

Mohseni, S., Baghizadeh, K., & Pahl, J. (2022). Evaluating Barriers and Drivers to Sustainable Food Supply Chains. *Mathematical Problems in Engineering*, *2022*, 1–24. https://doi.org/10.1155/2022/4486132

Monastyrnaya, E., Bris, G. Y. Le, Yannouc, B., & Petitd, G. (2017). A Template for Sustainable Food Value Chains. *International Food and Agribusiness Management Review*, *20*(4), 461–475. https://doi.org/10.22434/IFAMR2015.0061

Morone, P., & Cottoni, L. (2016). Transition to a sustainable agro-food system. In *Innovation Strategies in the Food Industry* (pp. 61–76). Elsevier. https://doi.org/10.1016/B978-0-12-803751-5.00004-0

Mutingi, M., Musiyarira, H., Mbohwa, C., & Kommula, V. P. (2017). *An Analysis of Enablers and Barriers of Sustainable Manufacturing in Southern Africa*. 4.

Nastis, S. A., Mattas, K., & Baourakis, G. (2019). Understanding Farmers' Behavior towards Sustainable Practices and Their Perceptions of Risk. *Sustainability*, *11*(5), 1303. https://doi.org/10.3390/su11051303

Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*. Pearson Education Limited.

Norton, R. D. (2017). *The competitiveness of tropical agriculture* (pp. 55–83). Elsevier. https://doi.org/10.1016/B978-0-12-805312-6.00006-4

Paul, S., Ali, S. M., Hasan, M. A., Paul, S. K., & Kabir, G. (2022). Critical Success Factors for Supply Chain Sustainability in the Wood Industry: An Integrated PCA-ISM Model. *Sustainability*, *14*(3), 1863. https://doi.org/10.3390/su14031863

Pérez, R. P., & Oddone, N. (2016). *Strengthening Value Chains: A Toolkit*.

Ramos-Mejía, M., Franco-Garcia, M.-L., & Jauregui-Becker, J. M. (2018). Sustainability Transitions in The Developing World: Challenges of Socio-Technical Transformations

Unfolding in Contexts of Poverty. *Environmental Science & Policy*, *84*, 217–223. https://doi.org/10.1016/j.envsci.2017.03.010

Royer, A., Bijman, J., & Bitzer, V. (2016). *Quality and innovation in food chains* (J. Bijman & V. Bitzer, Eds.; Issue 1). Wageningen Academic Publisher. https://doi.org/10.3920/978-90-8686-825-4

Schneemann, J., & Vredeveld, T. (2015). *Guidelines for value chain selection: Integrating economic, environmental, social and institutional criteria*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, *57*, 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933

Schoon, N., Seath, F., & Laura Jackson. (2013). *One Planet Living—The case for Sustainable Consumption and Production in the Post—2015*.

Seidel-Sterzik, H., McLaren, S., & Garnevska, E. (2018). Effective Life Cycle Management in SMEs: Use of a Sector-Based Approach to Overcome Barriers. *Sustainability*, *10*(2), 359. https://doi.org/10.3390/su10020359

Siddique, M. I., Garnevska, E., & Marr, N. E. (2018). Factors affecting marketing channel choice decisions of smallholder citrus growers. *Journal of Agribusiness in Developing and Emerging Economies*, *8*(3), 426–453. https://doi.org/10.1108/JADEE-03-2016-0014

Silva, M. E., & Figueiredo, M. D. (2020). Practicing sustainability for responsible business in supply chains. *Journal of Cleaner Production*, *251*, 119621. https://doi.org/10.1016/j.jclepro.2019.119621

Sjauw-Koen-Fa, A. R. (2012). *Framework for an inclusive food strategy: Co-operatives—A Key for smallholder inclusion into value chains* (pp. 2–44). Rabobank. https://www.researchgate.net/publication/283419481_Framework_for_an_inclusive_Food_Strategy_Co-operatives_-_a_key_for_smallholder_inclusion_into_Value_Chains

Sjauw-Koen-Fa, A. R., Blok, V., & Omta, O. S. W. F. (2016). Critical success factors for smallholder inclusion in high value-adding supply chains by food & agribusiness multinational enterprises. *International Food and Agribusiness Management Review*, *19*(1), 83–112.

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2020). Exploratory Factor Analysis; Concepts and Theory. *Hal Open Science : Advances in Applied and Pure Mathematics*, 9. https://hal.archives-ouvertes.fr/hal-02557344

Thorpe, J. (2018). Procedural Justice in Value Chains Through Public–private Partnerships. *World Development*, *103*, 162–175. https://doi.org/10.1016/j.worlddev.2017.10.004

Tray, B., Garnevska, E., & Shadbolt, N. (2021). Linking smallholder producers to high-value markets through vegetable producer cooperatives in Cambodia. *International Food and Agribusiness Management Review*, 1–16. https://doi.org/10.22434/IFAMR2020.0135

Trienekens, J. H. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review*, *14*(2), 32.

Vroegindewey, R., & Hodbod, J. (2018). *Resilience of Agricultural Value Chains in Developing Country Contexts: A Framework and Assessment Approach*. https://doi.org/10.3390/su10040916

Watkins, M. W. (2018). Exploratory Factor Analysis: A Guide to Best Practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, *8*(3). https://doi.org/10.33151/ajp.8.3.93

Zocca, R. O., Gaspar, P. D., da Silva, P. D., Nunes, J., & de Andrade, L. P. (2018). Introduction to Sustainable Food Production. In *Sustainable Food Systems from Agriculture to Industry*. https://doi.org/10.1016/b978-0-12-811935-8.00001-9

CHAPTER 5
Assessing smallholders' heterogeneity towards sustainable agrifood value chain in developing countries

In this chapter, the heterogeneity of smallholders towards sustainable agrifood value chain of developing countries is addressed. The manuscript has been published in the British Food Journal (BFJ). BFJ is a peer-reviewed journal in the scope of multidisciplinary in the food-related research such as the food systems, agriculture, and challenges of transitioning to sustainable food production. It is a Q2 journal, indexed by Scopus, Clarivate Analysis and others, with an impact factor of 3.47 (Scopus). The manuscript is well-aligned with the journal's scope.

Hidayati, D. R., Garnevska, E., & Ramilan, T. (2023). Assessing smallholders' heterogeneity towards sustainable value chain in developing countries. *British Food Journal*. https://www.emerald.com/insight/content/doi/10.1108/BFJ-11-2022-0940/full/html

Additional note:

1. The manuscript was selected to be presented at the British Food Journal Virtual International Conference on "Promoting Sustainable Food Production: Challenges, Practices, Impacts, and Solutions" (30 November - 1 December 2022).

Hidayati, D. R., Garnevska, E., & Ramilan, T. 2023. Assessing smallholders' heterogeneity towards sustainable value chain in developing countries, *the British Food Journal Virtual International Conference*, Malang, Indonesia, 30 November - 1 December 2022 (selected paper for presentation).

2. The extended abstract of this study was peer-reviewed and accepted to be presented at the International Food and Agribusiness Management Association (IFAMA) conference in June 2023 in Christchurch, New Zealand.

Abstract

Smallholders in developing countries' value chain have been impacted by the increased need for sustainable practices in the global agrifood business. Agrifood value chains in developing countries transform into global and higher value markets that involve smallholders as critical players. Smallholders, however, are a heterogeneous group, which may have discrepancies in outcome to meet the sustainability standard. This paper aims to empirically investigate smallholders' typology in sustainable value chain practice of developing countries. The study specifically looks for the enabling actors in sustainable agrifood value chain practice and their profiles in terms of socio-economic and current practice. Eight key enabling factors of sustainable value chain transformation were used to explore smallholders' typology. A quantitative method was applied in Indonesia's cashew sector with 159 respondents from the primary producer area on Madura Island. A combination of descriptive analysis, cluster analysis, cross tab analysis, and one-way ANOVA analysis was used in this study. Four types of groups were identified, each with distinct characteristics and arranged in priority order as follows: accelerators, progressors, inattentive, and conservative groups. The paper advances the understanding of smallholders' typology in the sustainable value chain in developing countries, providing more effective and targeted intervention for practitioners and policymakers.

Key words: smallholders, heterogeneity, typology, sustainable value chain, agrifood, developing countries.

5.1 Introduction

The growing demand for sustainable products in the global agrifood sector has affected value chain players in developing countries, especially smallholders. Smallholders are the key players in the value chain in developing countries, who are increasingly moving into higher-value markets in search of greater income (FAO, 2014; Hidayati et al., 2021b). In most cases, connecting smallholders to high-value markets also serves as an indispensable pathway out of their poverty and an important strategy to improve livelihoods (Grwambi et al., 2016). Smallholders, on the other hand, face a variety of issues such as a lack of skill, market access, and capability (Hidayati et al., 2021b; Sjauw-Koen-Fa et al., 2016; Trienekens, 2011). To access the higher-value markets, they face additional obstacle with the sustainable practice requirement. Sustainability practice has become a critical standard throughout the high-value markets chain in response to food security concerns in the agrifood sector (Berry et al., 2015; Borsellino et al., 2020). The players' practice

must adhere to sustainable standards that balance economic orientation with social and environmental aspects to produce high-end products through complex governance and value addition, known as sustainable value chain (Hidayati et al., 2021c). As a result, smallholders are pressured to comply with these sustainable value chain practices to enter higher-value markets.

Transforming smallholders into sustainable value chain practices is challenging, as it involves a large number of them, and they are a heterogeneous group. It is estimated that about 500 million smallholder farmers in developing countries are under-used and have potential for future food suppliers in 2050 (Sjauw-Koen-Fa, 2012; Sjauw-Koen-Fa et al., 2016). Nevertheless, it is likely that not all of the smallholders will be able to meet the rising compliance requirements in higher-value markets (Schoneveld et al., 2019). IFAD (2015) advised that a possible risk for sustainable agrifood value chain transformation may come from problems such as the complexity of actors. Smallholders may differ in responding to any changes. Farmers' attitudes and acceptance towards changes need to be contemplated in the first place (Barnes et al., 2022; Woolverton & Neven, 2014). There are countless examples of enablers (El Bilali, 2019; Grwambi et al., 2016; Hansen et al., 2018; Latruffe et al., 2016) and promising technologies which have not been adopted by smallholders in many developing countries (Kumar et al., 2019). According to Wulandari et al. (2022), it is mainly because generic recommendations are difficult for smallholders to apply in practice. Many recommendations frequently do not fit well with heterogeneous smallholder systems which require unique solutions (Goswami et al., 2014). Therefore, identifying characteristics of farmers within their farm business is vital to see the socio-demography of the internal driver/enabler related to sustainability (Hansson et al., 2019).

A number of previous studies have looked into core issues of smallholders' heterogeneity. To date, smallholder heterogeneity exploration has addressed smallholders' character variation in socio-economic and agro-ecological factors such as sustainable farm innovation (Schindler et al., 2015; Thar et al., 2021; Vanlauwe et al., 2019), commercial farming (Woolverton & Neven, 2014), farm household resilience (Ramilan et al., 2022), sustainability incentives within the farming programme (Kumar et al., 2019; Mutyasira, 2020; Zhu & Chen, 2022) and farm certification (Schoneveld et al., 2019). However, these studies largely address farm practice improvement, which is likely insufficient to lead the sustainable value chain practice. In order to grasp the big picture of sustainable value chain transformation, Hidayati et al (2023) found that focusing on farm practice improvement in sustainability may not be as effective as elevating governance and value-addition

dimensions. Eight enabling factors proposed included the structuring of strong enabling factors (farm practice milieu, information-communication), the moderate factors (the stakeholder support, market expansion, and certification motivation) and the weak factors (pre- and post-harvesting value, as well as value capture). However, as earlier mentioned, depending on the characteristics of the smallholders, some of them may work differently as enablers and impediments. Therefore, a greater viewpoint on unravelling smallholders' heterogeneity is required to better analyse their strengths and weaknesses (Woolverton & Neven, 2014). Further investigation is required to reveal which key players should receive priority attention in sustainable value chain practice. An exploration in this particular area is still limited.

This paper aims to empirically assess heterogeneity of smallholders in the sustainable agrifood value chain of developing countries. Since smallholders are distinguished by their variability, understanding smallholders' typology help to underline the key actors' characteristics and what kind of intervention should be provided for each different group in order to effectively transform towards sustainable value chain practice. Furthermore, this study offers a shifting focus from the conventional lens on farm sustainability into the overall picture of sustainable value chain activities. This study used Indonesia's cashew sector to represent the study agenda. Cashew is a high-value product aimed at the high-value market. On average, Indonesia sells more than 70% of the raw material products to the global trade, with smallholders contributing as the predominant players in this sector (around 99.8%). Furthermore, the Indonesian Government is constantly seeking ways to better participate in higher-value markets through this industry (Directorate General of Plantation, Agricultural Ministry of Indonesia, 2020). This study will further contribute to advancing the knowledge of sustainable value chain transformation mechanisms in developing countries. It also allows more prioritised players and targeted intervention in the process of sustainable value chain transformation, which is needed by both practitioners and policymakers. Following this introduction, the remainder of the paper's presentation provides a literature review, methodology, findings, discussion, and conclusion.

5.2 Literature review

The agrifood value chain discussion increasingly sparked the idea of sustainability incorporation into the practice. The sustainability concept is increasingly recommended in the agrifood chains' practice, as it is aligned with food security goals in sustainable production and consumption (Berry

et al., 2015; Borsellino et al., 2020). The sustainability concept advances the value chains by seeking the balance between economic orientation with social and environmental aspects (Giddings et al., 2002; Schindler et al., 2015). Hidayati et al., (2021c) defines a sustainable value chain as how sustainability factors (economic, social, and environmental) are incorporated into governance operations along the entire chain to contribute value. In fact, the economic dimension is the foundation for value chain development, yet, focusing solely on it risks widening the social degradation and causing environmental damage (Schneemann & Vredeveld, 2015). Economic growth that endangers the environment and human lives is no longer acceptable (Cavagnaro & Curiel, 2012; Hidayati et al., 2021c).

Given the above perspective, many value chain studies constituted how to enable sustainable practice by focusing on the developing countries' context. Developing countries face greater challenges in implementing sustainable practices than do developed countries, as smallholders are the predominant actors in the value chains. Various obstacles within smallholders include lack of capacity, skills, and access (Sjauw-Koen-Fa et al., 2016; Trienekens, 2011). They are also often disintegrated from most of governance and value-addition activities in the chain (Hidayati et al., 2021a, 2021b; Thorpe, 2018). Therefore, recent studies include an investigation of how firms can work with smallholders to build sustainable value chains (World Bank, 2019), move towards sustainable markets (Borsellino et al., 2020), achieve Sustainable Development Goals (SDGs) (Abraham & Pingali, 2020), and apply organic farming (Deka & Goswami, 2022). These studies have provided various enabling factors for smallholders to transform into sustainable practice. However, the majority of this research continues to be dominated by farm focus improvement. Whereas some studies found that farm activities often lead to the risk of environmental or social deterioration. Smallholders, for example, tend to use more chemical fertilisers (Siddique et al., 2018), and apply deforestation and exploitation (Morone & Cottoni, 2016).

For a more effective sustainable value chain practice transformation, Hidayati *et al.* (2022) propose a structural approach. The framework lays the foundation on prioritisation of action and advances the focus of improvement from farm production into governance and value-addition activities. The frame, however, does not imply that improving farm production is excluded from the sustainable transformation path. The foundation of sustainability practice lies on farm stage activities (FAO, 2014; Nastis et al., 2019). Farm production and information-communication are considered the strong factors to enable sustainable value chain practice while establishing a stronger platform for chain integration. The key to improve performance is integration into chain operations

(Childerhouse & Towill, 2011). Therefore, the secondary factors include market expansion, stakeholder support, and certification to improve the performance. In order to achieve a complete sustainable value chain practise, it is vital to deliver more value through pre- and post-harvesting value, as well as value capture. However, value delivery activities are common weak factors in developing countries' value chain. Overlooking the significance of integration with the rest of the value chain activities jeopardises smallholders' role and keeps them disconnected from the rest of the chain's activities (Hidayati et al., 2021c).

Regardless of various relevant factors to enable sustainable value chain practice, smallholders may not uniformly respond towards changes in practice. The technique for developing smallholders' practice should be cluster-specific (Wulandari et al., 2022). The chances for attaining sustainable practice must be assessed in relation to smallholders' perspectives and intentions in order to develop an effective and personalised intervention. Behaviour has profoundly influenced smallholders' typology to perceive the importance of sustainable value chain transformation. Behaviour motivates individual actors to adopt sustainable practices (Hansson et al., 2019; Kheiri, 2015; Nastis et al., 2019; Silva & Figueiredo, 2020). Therefore, capturing the heterogeneity is a critical first step in analysing prospective technological treatments and policy support (Kumar et al., 2019). Having a clear picture of the enablers/barriers could aid in managing the blind spots and creating a roadmap for sustainability implementation (Guimarães et al., 2022).

Analysis of typologies is beneficial, not only to capture the heterogeneity of farmers' motivations and perceptions, but it also helps to identify the dominant farmer type, since the ability to adapt is an important factor to determine a particular ecological identity (Barnes et al., 2022). Earlier studies have established a foundation for smallholders' typology investigation. Goswami (2014) states that studying smallholders' typology in socio-economic conditions (within farm typology) is useful for offering precise and effective technological interventions. Socio-economic variation includes smallholders' age, education, experience (Tauro et al., 2018), gender (Vanlauwe et al., 2019), farm size, farm production (Goswami et al., 2014; Jin et al., 2017) and agricultural organisation participation (Zhu & Chen, 2022). Others added that smallholder agricultural systems of practice are also varied due to agro-ecological factors (Mutyasira, 2020; Thar et al., 2021). Since the focus of these studies has also been on farm production, an update through research into a sustainable value chain lens is needed to increase awareness of the heterogeneity of smallholders. Failure to recognise the diversity of smallholders' objectives, attitudes and expertise runs the risk

of leading to the adoption of one-size-fits-all policies and interventions which are unlikely to address the core requirements for smallholder transition (Woolverton & Neven, 2014).

The aforementioned literature indicates that smallholders' compliance with sustainable practice demand has become the central issue in enabling developing countries' value chains to move into the higher-value markets. Smallholders are seen as critical partners in the co-construction of sustainable pathways (Tauro et al., 2018). An analytical framework is further developed in Figure 5.1 to illustrate that recognising smallholders' heterogeneity is essential to proceed with sustainable value chain practice transformation. In this case, the typology analysis used with the aid of eight enabling factors towards sustainable value chain practices is required, and a subsequent profile analysis (socio-economic and current practice) is needed to show the underlying causes of their behaviour. Setting the right balance of regulation and voluntary intervention that would sustain long-term behavioural change is one of the key challenges for achieving policy goals (Barnes et al., 2022).

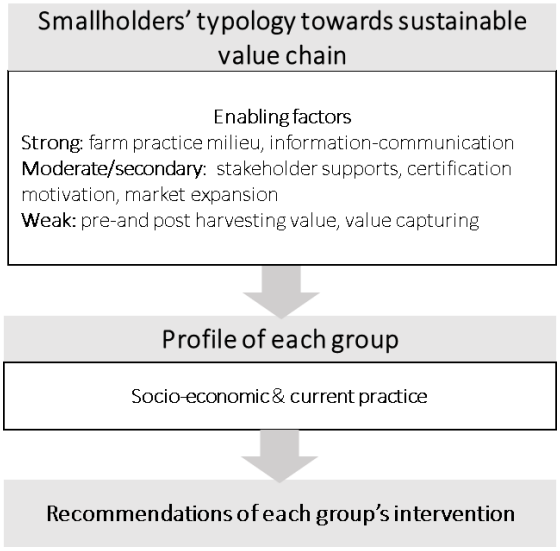


Figure 5. 1. Assessment framework for smallholders' typology towards sustainable agrifood value chains

5.3 Methodology

A total of 159 smallholders as respondents were gathered in 2021 in Indonesia. Sumenep Regency on Madura Island was purposively selected as the study area (in Figure 5.2). In 2014, the "Cashew Belt" programme was implemented in Sumenep Regency to expand the cashew planting area. Sumenep Regency is one of the key cashew nut producers, with productivity of about 0.76 ha, and it is also close to a trans-national commerce port facility. Smallholders with less than, or equal

to, two hectares, at least ten cashew trees, and at least two years of harvesting experience, were the criteria used to select the respondents. A structured interview was applied under strict pandemic protocol.

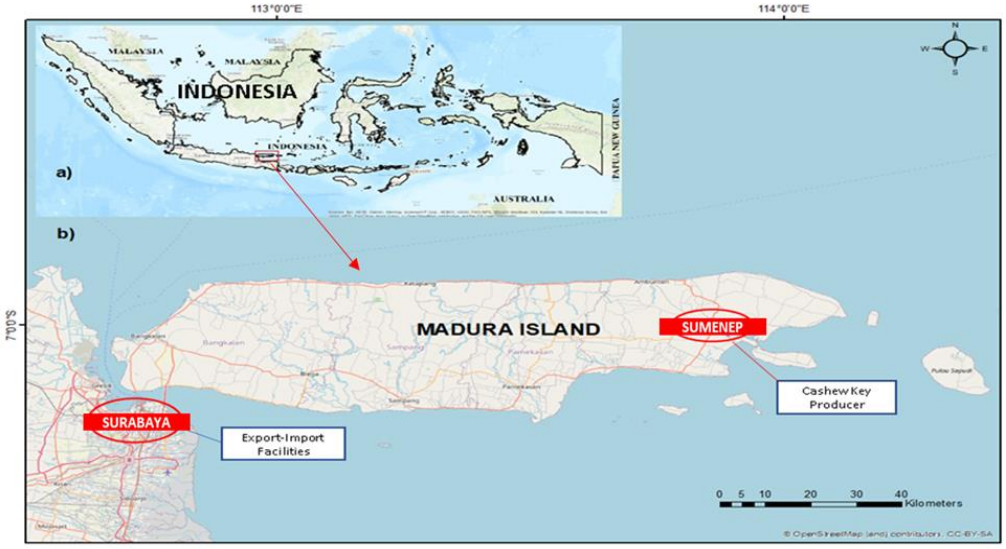


Figure 5. 2. Map of study area; Indonesia (a) and Madura Island (b)

A sequence of analysis was applied in this study. The typology analytical process starts with a classification of smallholders' intention towards sustainable value chains by using cluster analysis. Eight key aspects relating to enabling the sustainable value chains' transformation were used to develop variables of intention towards changes. The data was gathered based on the Likert scale (from 1 = Strongly Disagree up to 5 = Strongly Agree). Cluster analysis was employed because this method is capable of zooming smallholder's typology within the segmentation for predicting future trends (Nyambo et al., 2019). Within the clustering method, a two-step clustering method was applied, as it is considered more reliable and accurate, allowing the users to retain full information, and providing rich explanations for managerial decision-making purposes (Dietrich et al., 2017). The two-step cluster analysis method also allows for the simultaneous examination of demographic, psychographic, geographic, and behavioural data (Rundle-Thiele et al., 2015). It starts with K means procedures (*pre-clustering*) and then continues with hierarchical procedures (Dietrich et al., 2017; Ho Yu, 2010). In order to determine the best number of clusters, each solution is compared against each other, based upon the *Bayesian Information Criterion* (BIC). BIC is the remedy of *Akaike Information Criterion* (AIC), which could simplify penalising the cluster (Ho Yu, 2010). The goodness of the clusters' solution used silhouette measure, which ranges -1 up to 1. The software used was SPSS IBM 27.

Following the groups' classification, the next step is to profile each group. A statistic description is essential to assist quantitative analysis in the characteristic identification of farmers and farms (Papadopoulos et al., 2019). Cross-tab analysis and one-way ANOVA were used to examine each group's profile. Cross-tab analysis (used with Chi-square analysis) helps with the categorical data to reveal the cluster distribution differences, meanwhile one-way ANOVA was used to help with nominal data analysis and test significance differences in cluster means (Mutyasira, 2020; Neuman, 2014). The profile of each group is defined using socio-economic conditions and current practice. Socio-economic condition is explained using demography (age, gender, education, experience, and farmer group membership) and farm characteristics (i.e farm arrangement, farm size, production, etc). Finally, based on the characteristics of each group, intervention recommendations for sustainable value chain practice are made.

5.4 Results

5.4.1 General characteristics of respondents

The general characteristics of respondents are explained using socio-economic conditions and their current practice, as shown in Figure 5.3 (details in Appendix D1).

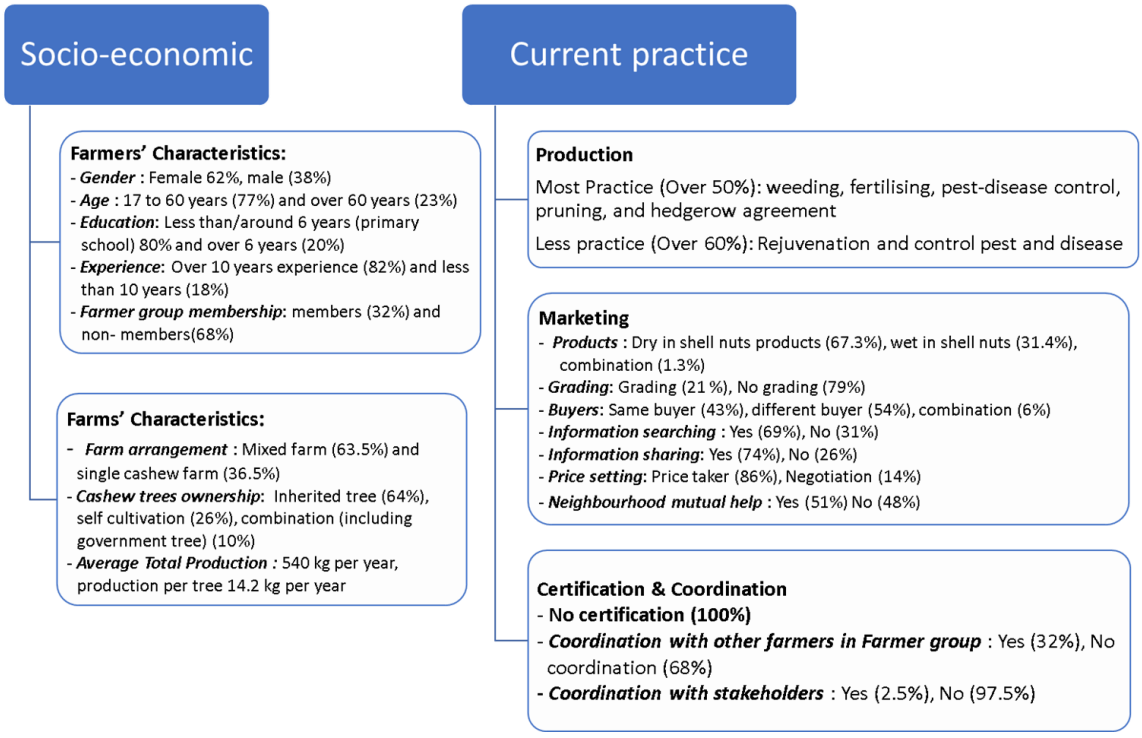


Figure 5. 3. General characteristics of respondents

Socio-economic characteristics shows that the majority of the respondents are in the productive age range of 17 to 60 years. Surprisingly, most of respondents are female farmers. According to respondents, a man and a woman will operate together in the cashew farming as a family business. Most of the respondents have around six years (or less) of education and over a decade of experience. Around 68% of respondents are listed as non-members of farmer groups. Thirty-two of the respondents who joined a farmer group mentioned that the majority of farmer group activities are not connected to cashew farming operations since mixed farming predominates in their farms. There are two typical farming arrangements, single cashew farm and mixed farm. Two third of cashew farms in the sample are arranged as mixed farming, where the middle part of land is used to cultivate other crops, mainly corn and paddy, as additional income. The average farm size is 0.45 ha (range from 0.01 ha up to 2 ha). Farm size, however, does not reflect the number of cashew trees (ranges from 10 to 210 trees). Three types of tree ownership are identified: inheritance, self-cultivation, and government grant trees. Because of the distinctive farm characteristics, estimating cashew productivity in kilograms (kg) per hectare is difficult, therefore, the production in this study is expressed using kilograms (kg) per tree per year. On average, cashew production per tree is 14.2 kg/per year (min 2.5 kg/year and max 72.7 kg/year). Meanwhile, the total production per farm can reach 540 kg/year (min 50 kg and max 12040 kg). However, many farmers with a similar number of trees produce varying yields. For instance, farmers with 15 cashew trees may have a wide range of production (from 90 kg up to 500 kg per year). The diverse management practices used on cashew farms could explain disparities in production.

Respondents' current practices shows that they are engaged in production and marketing activities, however, they pay less attention to certification and coordination with other farmers or with the stakeholders (i.e., government). Many of the cashew production activities were applied manually. Majority of farmers relied on themselves and their family-based labour. In marketing activities, respondents generally sell all their product in the form of dry in-shell nuts. However, 79% of respondents did not grade their products. In most practices, respondents preferred small-scale intermediaries as buyers and chose to sell to different buyers in order to get a better price and be more flexible in offering their products. Some smallholders, on the other hand, preferred the same buyers every year since they trusted them. They frequently have the transaction at the market or buyer's site rather than at farm/home, however, they are typically price-takers. Social activities related to cashew marketing showed that over half of respondents (52%) would assist their neighbours in marketing operations such as packing or carrying.

5.4.2 Smallholders' typology towards sustainable value chain practices

Four groups of smallholders were formed based on eight enabling factors of sustainable value chain practices, as shown in Figure 5.4 and 5.5 (details in Appendix D2). The silhouette measure of cohesion and separation is 0.3. The distribution of respondents in each cluster is relatively comparable.

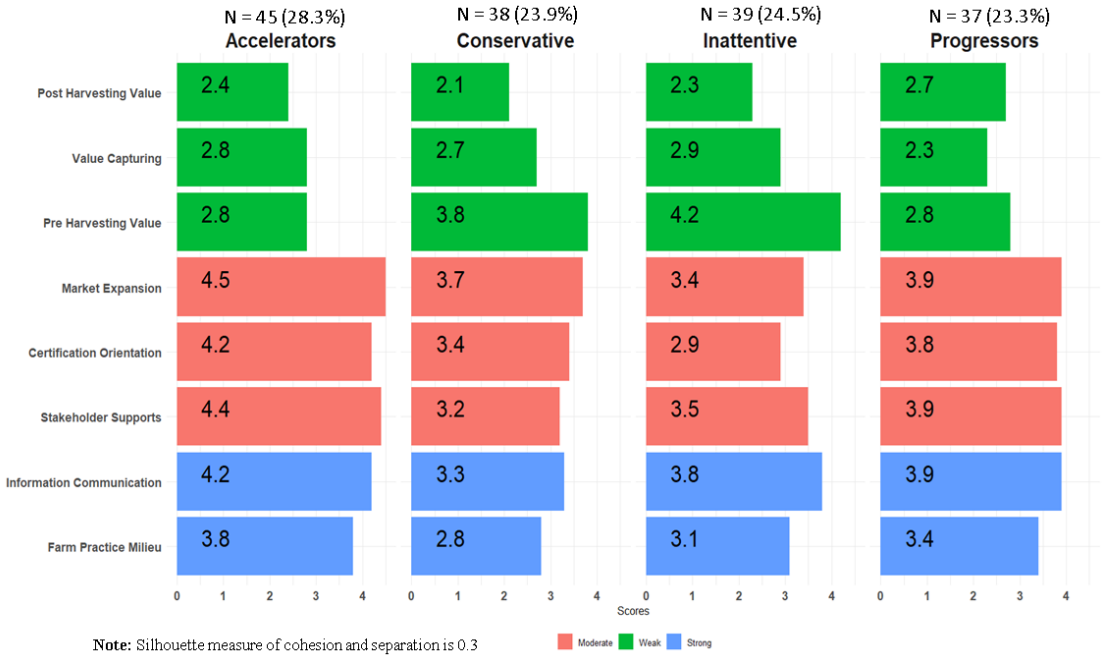


Figure 5. 4. Clustering of smallholders' typology towards sustainable value chain

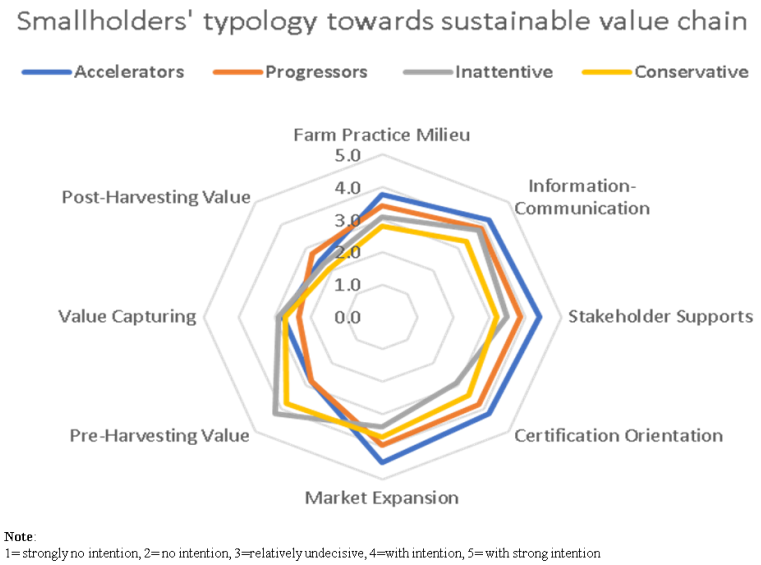


Figure 5. 5. Smallholders' typology towards sustainable value chain

Accelerators cluster represents smallholders with the most progressive intention towards sustainable value chain practices. In this cluster, the intention towards farm practice milieu, information-communication, stakeholder support, certification orientation, and market expansion, outperformed other clusters' intentions. Despite the fact that these intentions did not reach the strongest level, this is still the most progressive cluster. However, this cluster is less interested in pre and post-harvest harvest value creation, as well as value capture.

Progressors cluster has a progressive intention towards most sustainable value chain practices, but not at the level of the accelerators cluster. The intention to commit to the farm practice milieu is relatively moderate. However, this cluster has good intentions towards information communication, stakeholder support, certification orientation, and market expansion. Similar to the accelerators cluster, this group is less concerned with pre- and post-harvest value, as well as value capturing.

Inattentive cluster indicates a moderate intention (relatively unsure) towards some sustainable value chain practices such as farm practice milieu, certification, stakeholder support, and value capture. This cluster, however, demonstrates a need for information-sharing and market expansion, and the most committed group towards pre-harvest value practice. This cluster, like the others, is less concerned with post-harvest value.

Conservative cluster indicates the lowest intentions towards sustainable value chain practices in comparison to the other clusters. Smallholders in this cluster have intentions toward market expansion and certification orientation, but they are still undecided on information-communication and stakeholder support. Surprisingly, despite having little interest in some practices (farm practice milieu, value capture, and post-harvest value practice), this cluster has an intention to engage in pre-harvest value practice.

5.4.3 Clusters' profile in socio-economic and current practice

Following the clustering of smallholders, the next step is to understand their profile based on their socio-economic and current practice characteristics. These characteristics indicate some patterns of similarities and differences between clusters. The similarities of respondents' characteristics include females, productive age, and good previous experience. Some of the differences are in terms of education and farmer group membership distribution. Meanwhile, farm typology characteristics vary more between clusters, especially in farm size, trees' type, production,

and farm arrangement. More differences exist across groups in current practice, particularly in production and marketing activities. Certification and coordination are less common practices in all groups. Differences between clusters are identified by using p value (≤ 0.05) to recognise the key profile, as shown Table 5.1 and Table 5.2 (details in Appendix D3).

Table 5. 1. Key profile in socio-economic of each cluster

Socio-economic Profile	Accelerators	Progressors	Inattentive	Conservative
a. Demography				
- Education	Some educated farmers exist (including tertiary)	A small number of educated farmers exist (no tertiary)	Some educated farmers exist (including tertiary)	Some educated farmers exist (no tertiary)
- Farmer Group Membership	Members and non-members are comparable	Non-members are dominant	Non-members are dominant	Non-members are dominant
b. Farm characteristic				
- Farm size	± 0.55 ha	± 0.38 ha	± 0.5 ha	± 0.36 ha
- Cashew Trees Ownership	Comparable inheritance and self-cultivation tree (include government grant tree)	Comparable inheritance and self-cultivation tree (include government grant tree)	Inheritance is dominant	Inheritance tree is high (Over 90%)
- Cashew Production	Over 1000 kg/year (total production), 21 kg/tree (productivity)	± 400 kg/year (total production), 16 kg/tree (productivity)	375 kg/year (total production), 11 kg/tree (productivity)	200 kg/year (total production), 7.5 kg/tree (productivity)
- Cashew Farm Arrangement	Mixed farming is dominant	Mixed farming is dominant	Mixed farming is dominant	Single cashew farming is dominant

Note: Detail statistical data is presented in the Appendix D3; The key profile distinction was based on Sig = p value ≤ 0.05 (Chi square was used for categorical data, and One-way ANOVA was used for numerical data).'Dominant' refers to greater than 50%.

Table 5. 2. Key profile in current practice of each cluster

Current Practice Profile	Accelerators	Progressors	Inattentive	Conservative
a. Production				
- Rejuvenation	Application and no-application are comparable	Application and no-application are comparable	No-application is dominant	No-application is dominant
- Pest and disease control	No-application is dominant	Over 95% no-application	No-application is dominant	No-application is dominant
- Pruning	Application is dominant	Application is dominant	No-application is dominant	Over 95% application
- Hedgerow agreement	Application is dominant	Application is dominant	Over 90% no-application	No-application is dominant
b. Marketing				
- Products	Dry in shell nut is dominant	Dry in shell nut is dominant	Dry and wet in shell nut products are comparable	Dry and wet in shell nut products are comparable
- Volume	Over 1000 kg dry in shell nut	±375 kg dry in shell nut	±311 kg dry in shell nut	±190 kg dry in shell nut
- Price	± 15,250 IDR/kg wet in shell nut ± 16,871 IDR/kg dry in shell nut	± 16,818 IDR/kg ± 17,000 IDR/kg	± 18,222 IDR/kg ± 20,119 IDR/kg	± 17,000 IDR/kg ± 19,000 IDR/kg
- Grading	No-grading is dominant	100%no-grading	No-grading is dominant	Grading and no-grading are comparable
- Transaction	Different buyer is dominant	Different buyer is dominant	Same buyer is dominant	Same buyer is dominant
- Transaction site	Over 95% Market/buyers' site	Market/buyers' site is dominant	Market/buyers' site is dominant	Farmgate/home and market /buyers' site are comparable
- Information Sharing	Application is dominant	Application is high (Over 90%)	Application and no-application are comparable	Application is dominant
- Neighborhood helping	Mutual help is dominant	Mutual help is dominant	Mutual help is dominant	No-mutual help is dominant
c. Certification & coordination	Coordination (with others) and no-coordination are comparable	No-coordination is dominant	No-coordination is dominant	No-coordination is dominant

Note: Detail statistical data is presented in the Appendix D3; The key profile distinction was based on Sig = p value ≤ 0.05 (Chi square was used for categorical data, and One-way ANOVA was used for numerical data. 'Dominant' refers to greater than 50%.

Accelerators Cluster

Socio economic: The demography characteristic shows that the accelerators group contains 51% farmer group members and 49% non-members. Respondents with tertiary education are also found in this cluster. Farm characteristic data indicates that this cluster outperforms the other clusters in terms of farm size (0.5 ha), total production (over 1000 kg) and production per tree (21 kg/tree), government grant tree ownership (29%), and mixed farming arrangement (71%).

Current Practice: The majority of respondents in this cluster practised all aspects of production, with the exception of pest and disease control practice. This cluster, however, has more dynamics in marketing. The most dominant items for sales are dry in-shell nuts products where average sales volume reached 1,067 kg, outpacing other clusters. Grading is not performed by 84% of respondents and they are price-takers. Despite the low price, the majority of transactions have involved different buyers at market/buyers' site and included information searching-sharing with others. The neighbourhoods are also benefited by this cluster's help.

Progressors Cluster

Socio-economic: In this cluster, the percentage of farmers who are non-members of a farmer-group reached 81%, and only 19 % are members. No tertiary education is found in this cluster, and the proportion of respondents with more than six years' education is the lowest (8%). Farm characteristics of this cluster shows that the average farm size (0.38 ha) and cashew tree number (28) in this cluster are comparable to those in cluster 2. The average total production in this cluster reached 400 kg, and the production per tree reached 16 kg. Eight percent of government grant tree ownership is found in this cluster. The distribution of self-cultivated and inherited trees is also likely comparable. Of the respondents in this cluster, 68% applied a mixed farming arrangement.

Current Practice: In farm production, most smallholders in this cluster neglect pest and disease control and fertilising. In marketing, dry in-shell nuts take 70% percent of sale items. The sales volume of dry in-shell nuts reached 374 kg on average. Meanwhile, all respondents in this cluster do not grade their cashew products. The price they received for wet in-shell is 16,818 IDR per kg, and for dry in-shell nut is 17,000 IDR. The transaction is dominant with different buyers at the market site. Information searching-sharing is a predominant practice. The majority of smallholders in this cluster also help their neighbourhood.

Inattentive Cluster

Socio-economic: In demographic characteristics, 76% of respondents in this cluster are non-farmer group members, and only around 20% of farmers in this cluster are members of a farmer group. However, 8% of the cluster members have received a tertiary education. Farm characteristics shows that cluster 3 has an average farm size (0.5 ha), tree number (35), and mixed farming arrangement (68%) and are relatively close to those in cluster 1. Its average total production is 375 kg and production per tree is 11 kg. No government grant trees' ownership were found in this cluster, and inheritance trees comprise around 74% proportion.

Current Practice: Production and marketing practices in this cluster are comparable to those of conservative cluster in many ways. Rejuvenation, pest and disease control, and hedgerow agreement are neglected in the farm production. In marketing practice, wet in-shell nuts (46%) and dry in-shell nuts sales (54%) are relatively comparable. The average sales volume for wet in-shell nuts is 415 kg, which is higher than dry in-shell nuts' sale volume (311 kg). Seventy-two percent of respondents did not grade their cashew products. However, this cluster received the best price compared to other clusters. The wet in-shell nut price is 18,222 IDR per Kg, and dry in-shell nut price is 20,119 IDR/Kg. Market/buyer's site transaction with same buyers' preference is a dominant practice. Fifty-one percent of respondents practised searching for price information, and only 49% respondents share their price information. Of the respondents in this cluster, 59% practised helping their neighbourhood.

Conservative Cluster

Socio-economic: Demographic data indicates that around 66% have farmer group membership, while 34% farmers in this cluster have a farmer group membership. This cluster does not include farmers with tertiary education. However, over 20% of respondents in this cluster have more than six years' education (junior and senior high schools). Farm characteristics demonstrate that this cluster has the smallest farm size (0.36 ha), the lowest average of both total production (200 kg/year) and production per tree (7.5 kg/tree/year), and no government grant trees' ownership. However, this cluster has the highest proportion for inherited cashew trees (95%) and single cashew farms' arrangement (55%).

Current Practice: In the farm production, the majority of respondents in this cluster neglect rejuvenation, pest and disease control, and hedgerow agreement. In marketing practice, 55% of

respondents in this cluster sell dry in-shell nut items, and 39% sell wet in-shell nuts. The sales volume for both items indicates the lowest volume compared to other clusters (190 kg for dry in-shell nuts and 169 kg for wet in-shell nuts). However, grading was practised by 42% of respondents in this cluster. The price received by respondents in this cluster is around 17,412 IDR/kg for wet in-shell nuts and 19,217 IDR/kg for dry in-shell nuts. Although this cluster dominantly practised sharing-searching for information, farmgate and home transactions (which including the same buyers) are prevalent. Moreover, around 84% of this cluster's members do not help their neighbourhood farmers.

5.5 Discussion

The results of this study demonstrated that there are four different clusters of smallholders in the captured heterogeneity towards sustainable value chain practices, with each group characteristic having a specific goal for implementing their practises. However, in general, there are two clusters of smallholders who are enthusiastic about sustainable value chain practises, while the others two have less interest in it.

Accelerators and progressors have favourable intentions towards sustainable value chain practices that are consistent with the frame thinking on strong, moderate, and weak factors. However, they exist with varying degrees of intention. Accelerators are the most committed smallholders to sustainable value chain practices and have a relatively high socioeconomic profile, particularly in education, farmer group participation, farm size, and productivity. They also provide best practices in farm production as well as marketing activities. An earlier study found that farmers with higher levels of agricultural intensification and sustainability are more commercially oriented, have larger landholdings, and have more productive assets (Mutyasira, 2020). Smallholders' characteristics with lower socio-economic status may also contribute to a progressive intent (progressors cluster). Although they have capacity limitations (i.e., farm size, farmer group participation, etc.), their good practice in farm production and marketing may serve as a valuable point, which has the potential for improved sustainable value chain practice As Wulandari *et al*. (2022) claim, farmers' resources are classified not only by their assets but also by their capacity and capability. However, it should be noted that both clusters (accelerators and progressors) receive relatively low prices for their products, as they sell them with very little value-added activities.

Smallholders with limited interest in sustainable value chain practice were found in the inattentive and conservative clusters. Interestingly, the enabling factors have bending points within these clusters, where weak factors may switch roles with strong factors. As an example, the respondents in these clusters paid special attention to pre-harvest value, practised more grading activities, and received better prices respectively. Meanwhile, in most cases, pre-harvest value is often considered one of the weak factors that hinder smallholders' practice development in most developing countries (Deka & Goswami, 2022; FAO, 2014). Smallholders in these clusters also relied on the same buyers. This result, therefore, indicates that if the current price is satisfying, smallholders are likely to be content with the practice and hesitant to set new goals for moving forwards with other practices. However, the profiles of these clusters (the inattentive and conservative) are disparate. The inattentive cluster shows moderate intention towards sustainable value chain practices and has a good socio-economic profile, as evidenced by a high level of education and large farm size. However, smallholders in this cluster ignore sustainable farm production activities, which contributes to their low productivity. This characteristic is nearly the opposite of the progressors. It should be then noted that designing intervention support to address smallholder challenges can be informed by distinguishing smallholders based on socio-economic characteristics which differ from their farms' technical characteristics (Schoneveld et al., 2019). In the meantime, the conservative cluster has the least intention to engage in sustainable value chain practices and has the lowest socio-economic background in terms of education, farm size, and productivity. Smallholders in this cluster primarily own a single cashew farm, but they have the poorest farm production and marketing practises. In this case, Barnes et al. (2022) discovered that farmers with low engagement in current sustainable practices typically lack motivation or are more interested in conservationist practices.

While it is interesting to discuss the differences between each cluster, the similarities in characteristics (female, productive age, and experienced farmers) may also offer some useful insights and potential for further intervention basis. According to FAO research, women farmers are 20-30% less productive than men due to a lack of access to resources (Seville et al., 2016). Therefore, the cashew sector may provide a lot of room for women empowerment in the future. Despite their low level of education, respondents generally have learnt agricultural skills from their families over the decades. Some scholars also revealed that within productive age, smallholders could gain knowledge from various sources (Donkor et al., 2022; Wulandari et al., 2022). Nevertheless, as a local institution, farmer groups may not be able to fully facilitate this since the majority of smallholders are non-members. Many cashew farmers who are not members of farmer

groups may miss out on the chance to strengthen their coordination with stakeholders. Farmer organisations are often used by the media to coordinate with the government and target for policy implementation. While the membership of the farmer group is often determined primarily by homogeneity, such as assets' ownership connected to farm business (Apparao et al., 2019), this might not always be the case. Membership of farmer groups in the study area accommodates a variety of agricultural crops (such as paddy rice, corn, etc) that may not put cashew as a priority. However, membership in farmer groups is viewed as one of the essential requirements to proceed further with sustainable value chain practices. Azevedo et al. (2018) revealed that farmers who are organised in groups (i.e., farmer groups or cooperatives) perform better and exhibit more positive behaviour, as demonstrated by the accelerators. Hence, this area may need further exploration in the future.

The summary of findings in this study is illustrated in Figure 5.6 as well as the level of intervention required. The enabling actors are arranged and prioritised based on each group's character (accelerators, progressors, inattentive, and conservative), which helps to consolidate and customise the intervention.

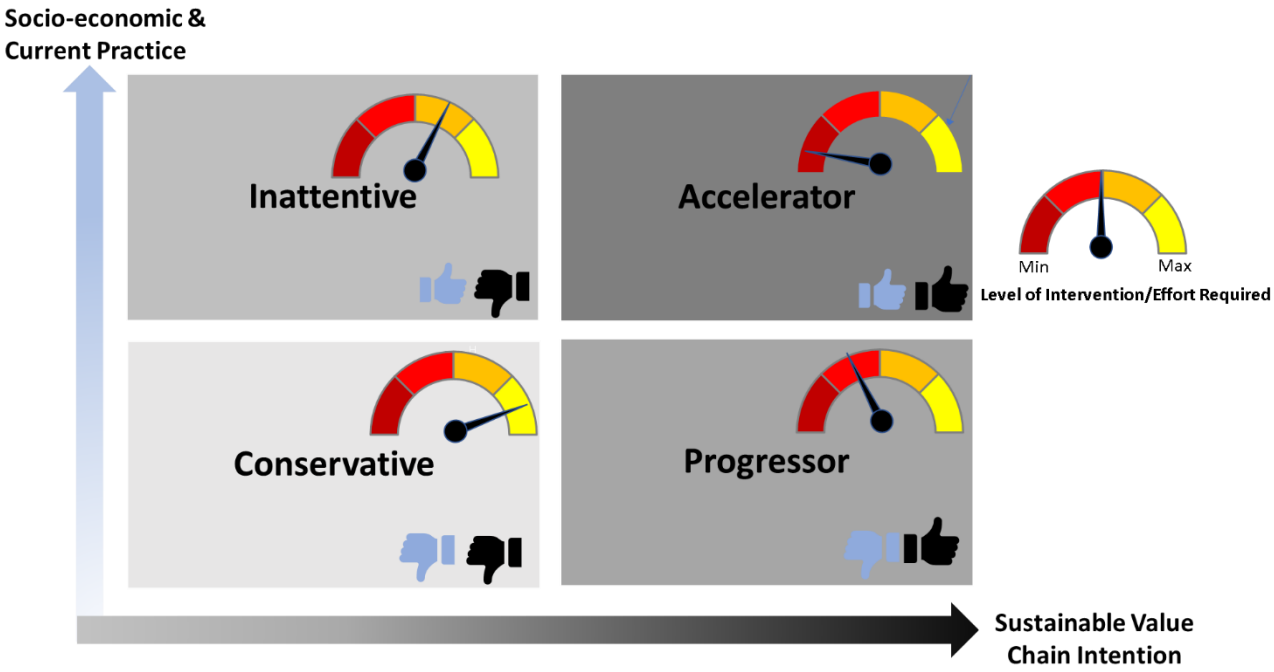


Figure 5. 6. Smallholders' heterogeneity towards sustainable value chain intervention

Accelerators should be the first group to be prioritised for intervention because they require a minimum effort due to their advanced level of sustainable value chains practice. The effort of

intervention should focus on their capacity to create more value-adding activities, which still remain a challenge for them. In order to increase the price of their products and create more value, they have to add activities such as grading and further processing activities (shelled nuts or more processed products). Progressors should be the next focus of intervention to sustainable value chain practices. This cluster may be inspired to adopt more sustainable practices. The productivity of their farm can still be further optimised such as by applying rejuvenation and controlling pests and diseases. Similar to the accelerators group, they need to extend and create more value-adding products (i.e., grading and processed products). FAO (2014) revealed, farmers have agreed to collaborate in order to address some of the issues they face, such as market prices and the promotion of value addition. Inattentive smallholders are the third priority for intervention due to their less commitment to the sustainable value chain practice. The intervention should focus on improving productivity, finding new buyers, and advancing their value addition activities into shelled nuts or more processing products. The last priority goes to the conservative smallholders. They require extensive intervention in most of the activities as they have the lowest capacity and intentions to advance into sustainable value chain practices. In this case, government and suppliers need to cooperate to push forward towards sustainability goals in the chain (Mohseni et al., 2022).

Smallholders with different types may also benefit from a combination of interventions for key activities (i.e., in value-adding activities and membership in farmer group). However, achievements will be different as the profile of each group is fundamentally different. If the intervention is successful, the inattentive group may shift into the accelerators group; meanwhile, the conservative group may shift into the progressors group.

5.6 Conclusion

Overall, this study offers a greater grasp of how to identify actors who are more in line with the demands of higher-value markets and further prioritise them to proceed with the transformation towards sustainable value chain practice. The typology approach provides a useful tool for setting a baseline towards policy objectives. This study attempts to fill the gap of understanding in the area in order to discern the enabling actors for sustainable value chain practice. The research on this topic is still limited due to the fact that many sustainable value chain studies continue to offer recommendations to smallholders and overlook their variability. Meanwhile, studies in smallholders' typology largely concentrate on sustainable farm improvements. Four clusters that were identified and prioritised (accelerators, progressors, inattentive, and conservative groups),

create the groundwork for an effective intervention based on the characteristics and requirements of the groups, providing clear advice for practitioners and policymakers.

More research is needed to address some of the study limitations. Exploration of other agrifood food sectors would be required, as the situation of the cashew sector may not represent the overall agrifood sector. Furthermore, the cashew sector scope in this case study is limited to a subset of an area, which may not represent the whole cashew business in Indonesia, or other developing countries. Finally, a study on aligning and harmonising smallholders' perspectives with the rest of the value chain actors would help to advance and confirm the chain's perspective in sustainable value chain transformation.

References of Chapter *5*

Abraham, M., & Pingali, P. (2020). Transforming Smallholder Agriculture to Achieve the SDGs. In S. Gomez y Paloma, L. Riesgo, & K. Louhichi (Eds.), *The Role of Smallholder Farms in Food and Nutrition Security* (pp. 173–209). Springer International Publishing. https://doi.org/10.1007/978-3-030-42148-9_9

Apparao, D., Garnevska, E., & Shadbolt, N. (2019). Examining commitment, heterogeneity and social capital within the membership base of agricultural co-operatives—A conceptual framework. *Journal of Co-Operative Organization and Management*, *7*(1), 42–50. https://doi.org/10.1016/j.jcom.2019.03.003

Barnes, A. P., Thompson, B., & Toma, L. (2022). Finding the ecological farmer: A farmer typology to understand ecological practice adoption within Europe. *Current Research in Environmental Sustainability*, *4*, 100125. https://doi.org/10.1016/j.crsust.2022.100125

Berry, E. M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P. (2015). Food security and sustainability: Can one exist without the other? *Public Health Nutrition*, *18*(13), 1–10. https://doi.org/10.1017/S136898001500021X

Borsellino, V., Schimmenti, E., & El Bilali, H. (2020). Agri-Food Markets towards Sustainable Patterns. *Sustainability*, *12*(6), 2193. https://doi.org/10.3390/su12062193

Cavagnaro, E., & Curiel, G. (2012). The Three Levels of Sustainability. In *The Three Levels of Sustainability*. Greenleaf Publishing Limited. https://doi.org/10.4324/9781351277969

Childerhouse, P., & Towill, D. R. (2011). Arcs of supply chain integration. *International Journal of Production Research*, *49*(24), 7441–7468. https://doi.org/10.1080/00207543.2010.524259

Deka, N., & Goswami, K. (2022). Organic cultivation and sustainable value chain development for tea smallholders: Findings from Assam, India. *Sustainable Production and Consumption*, *32*, 562–579. https://doi.org/10.1016/j.spc.2022.05.004

Dietrich, T., Rundle-Thiele, S., & Kubacki, K. (Eds.). (2017). *Segmentation in Social Marketing*. Springer Singapore. https://doi.org/10.1007/978-981-10-1835-0

Directorate General of Plantation, Agricultural Ministry of Indonesia. (2020). *Strategic Plan: DIrectorate General of Plantation, Agricultural Ministry of Indonesia 2020-2024*. Directorate General of Plantation, Agricultural Ministry of Indonesia. https://ditjenbun-ppid.pertanian.go.id/doc/16/RENSTRA_Ditjen%20Perkebunan%202020-2024.pdf

Donkor, E., Onakuse, S., Bogue, J., & de los Rios Carmenado, I. (2022). Income inequality and distribution patterns in the cassava value chain in the Oyo State, Nigeria: A gender perspective. *British Food Journal*, *124*(13), 254–273. https://doi.org/10.1108/BFJ-06-2021-0663

El Bilali, H. (2019). The Multi-Level Perspective in Research on Sustainability Transitions in Agriculture and Food Systems: A Systematic Review. *Agriculture*, *9*(4), 74. https://doi.org/10.3390/agriculture9040074

FAO. (2014). *Developing sustainable food value chains: Guiding principles*. FAO. http://www.fao.org/3/i3953e/i3953e.pdf

Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development*, *10*(4), 187–196. https://doi.org/10.1002/sd.199

Goswami, R., Chatterjee, S., & Prasad, B. (2014). *Farm types and their economic characterization in complex agro-ecosystems for informed extension intervention: Study from coastal West Bengal, India*. 24.

Grwambi, B., Ingenbleek, P., Obi, A., Schipper, R. A., & van Trijp, H. C. M. (2016). 8. Towards achieving sustainable market access by South African smallholder deciduous fruit

producers: The road ahead. In J. Bijman & V. Bitzer (Eds.), *Quality and innovation in food chains* (pp. 161–186). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-825-4_8

Guimarães, Y. M., Eustachio, J. H. P. P., Leal Filho, W., Martinez, L. F., do Valle, M. R., & Caldana, A. C. F. (2022). Drivers and barriers in sustainable supply chains: The case of the Brazilian coffee industry. *Sustainable Production and Consumption*, *34*, 42–54. https://doi.org/10.1016/j.spc.2022.08.031

Hansen, U. E., Nygaard, I., Romijn, H., Wieczorek, A., Kamp, L. M., & Klerkx, L. (2018). Sustainability Transitions in Developing Countries: Stocktaking, New Contributions and a Research Agenda. *Environmental Science & Policy*, *84*, 198–203. https://doi.org/10.1016/j.envsci.2017.11.009

Hansson, H., Thompson, B., Manevska, G., Toma, L., Leduc, G., & Vranken, L. (2019). *Drivers of Farmers' Up-Take of Ecological Approaches – A Conceptual Framework with a Behavioural Focus*. 54.

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021a). Agrifood value chain assessment in developing countries: A case of Indonesia's cashew sector. *E3S Web of Conferences*, *306*, 02045. https://doi.org/10.1051/e3sconf/202130602045

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021b). Transforming Developing Countries Agrifood Value Chains. *Int. J. Food System Dynamics*, *12*(4), 358–374. http://centmapress.ilb.uni-bonn.de/ojs/index.php/fsd/article/view/96/1073

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021c). Sustainable Agrifood Value Chain—Transformation in Developing Countries. *Sustainability*, *13*(22), 12358. https://doi.org/10.3390/su132212358

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2023). Enabling sustainable agrifood value chain transformation in developing countries. *Journal of Cleaner Production*, Volume 395 (Available online 11 February 2023). https://doi.org/10.1016/j.jclepro.2023.136300.

Ho Yu, C. (2010). Exploratory data analysis in the context of data mining and resampling. *International Journal of Psychological Research*, *3*(1), 9–22. https://doi.org/10.21500/20112084.819

IFAD. (2015). *Sustainable Inclusion of Smallholders in Agricultural Value Chain*. IFAD. https://www.ifad.org/documents/38714170/40264252/Scaling+up+note+-+Sustainable+inclusion+of+smallholders+in+agricultural+value+chains.pdf

Jin, Z., Azzari, G., Burke, M., Aston, S., & Lobell, D. B. (2017). *Mapping Smallholder Yield Heterogeneity at Multiple Scales in Eastern Africa*. 15.

Kheiri, S. (2015). Identifying the Barriers of Sustainable Agriculture Adoption by Wheat Farmers in Takestan, Iran. *International Journal of Agricultural Management and Development*, *5*(3), 159. https://doi.org/10.5455/ijamd.175275

Kumar, S., Craufurd, P., Haileslassie, A., Ramilan, T., Rathore, A., & Whitbread, A. (2019). Farm typology analysis and technology assessment: An application in an arid region of South Asia. *Land Use Policy*, *88*, 104149. https://doi.org/10.1016/j.landusepol.2019.104149

Latruffe, L., Diazabakana, A., Bockstaller, C., Desjeux, Y., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2016). Measurement of Sustainability in Agriculture: A Review of Indicators. *Studies in Agricultural Economics*, *118*(3), 123–130. https://doi.org/10.7896/j.1624

Mohseni, S., Baghizadeh, K., & Pahl, J. (2022). Evaluating Barriers and Drivers to Sustainable Food Supply Chains. *Mathematical Problems in Engineering*, *2022*, 1–24. https://doi.org/10.1155/2022/4486132

Morone, P., & Cottoni, L. (2016). Transition to a sustainable agro-food system. In *Innovation Strategies in the Food Industry* (pp. 61–76). Elsevier. https://doi.org/10.1016/B978-0-12-803751-5.00004-0

Mutyasira, V. (2020). Prospects of sustainable intensification of smallholder farming systems: A farmer typology approach. *African Journal of Science, Technology, Innovation and Development*, *12*(6), 727–734. https://doi.org/10.1080/20421338.2019.1711319

Nastis, S. A., Mattas, K., & Baourakis, G. (2019). Understanding Farmers' Behavior towards Sustainable Practices and Their Perceptions of Risk. *Sustainability*, *11*(5), 1303. https://doi.org/10.3390/su11051303

Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson Education Limited.

Nyambo, D. G., Luhanga, E. T., & Yonah, Z. Q. (2019). A Review of Characterization Approaches for Smallholder Farmers: Towards Predictive Farm Typologies. *The Scientific World Journal*, *2019*, 1–9. https://doi.org/10.1155/2019/6121467

Papadopoulos, S., Markopoulos, T., Chousou, C., Natos, D., & Mattas, K. (2019). Highlighting a Key Question for the Common Agricultural Policy: Adoption of Agriculture System Types. *Int. J. Food System Dynamics*, *10*(3), 250–261. https://dx.doi.org/10.18461/ijfsd.v10i2.16

Ramilan, T., Kumar, S., Haileslassie, A., Craufurd, P., Scrimgeour, F., Kattarkandi, B., & Whitbread, A. (2022). Quantifying Farm Household Resilience and the Implications of Livelihood Heterogeneity in the Semi-Arid Tropics of India. *Agriculture*, *12*(4), 466. https://doi.org/10.3390/agriculture12040466

Rundle-Thiele, S., Kubacki, K., Tkaczynski, A., & Parkinson, J. (2015). Using two-step cluster analysis to identify homogeneous physical activity groups. *Marketing Intelligence & Planning*, *33*(4), 522–537. https://doi.org/10.1108/MIP-03-2014-0050

Schindler, J., Graef, F., & König, H. J. (2015). Methods to assess farming sustainability in developing countries. A review. *Agronomy for Sustainable Development*, *35*(3), 1043–1057. https://doi.org/10.1007/s13593-015-0305-2

Schneemann, J., & Vredeveld, T. (2015). *Guidelines for value chain selection: Integrating economic, environmental, social and institutional criteria*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, *57*, 101933. https://doi.org/10.1016/j.gloenvcha.2019.101933

Seville, D., Shipman, E., & Daniels, S. (2016). *Towards a Shared Approach for Smallholder Performance Measurement*. Sustainable Food Lab. https://thecosa.org/wp-content/uploads/2017/04/Towards-a-Shared-for-Approach-Small-Holder-Performance-Measurement-Common-Indicator-Metrics_012516.pdf

Siddique, M. I., Garnevska, E., & Marr, N. E. (2018). Factors affecting marketing channel choice decisions of smallholder citrus growers. *Journal of Agribusiness in Developing and Emerging Economies*, *8*(3), 426–453. https://doi.org/10.1108/JADEE-03-2016-0014

Silva, M. E., & Figueiredo, M. D. (2020). Practicing sustainability for responsible business in supply chains. *Journal of Cleaner Production*, *251*, 119621. https://doi.org/10.1016/j.jclepro.2019.119621

Sjauw-Koen-Fa, A. R. (2012). *Framework for an inclusive food strategy: Co-operatives—A Key for smallholder inclusion into value chains* (pp. 2–44). Rabobank. https://www.researchgate.net/publication/283419481_Framework_for_an_inclusive_Food_Strategy_Co-operatives_-_a_key_for_smallholder_inclusion_into_Value_Chains

Sjauw-Koen-Fa, A. R., Blok, V., & Omta, O. S. W. F. (2016). Critical success factors for smallholder inclusion in high value-adding supply chains by food & agribusiness

multinational enterprises. *International Food and Agribusiness Management Review*, *19*(1), 83–112.
Tauro, A., Gómez-Baggethun, E., García-Frapolli, E., Lazos Chavero, E., & Balvanera, P. (2018). Unraveling heterogeneity in the importance of ecosystem services: Individual views of smallholders. *Ecology and Society*, *23*(4), art11. https://doi.org/10.5751/ES-10457-230411
Thar, S. P., Ramilan, T., Farquharson, R. J., & Chen, D. (2021). Identifying Potential for Decision Support Tools through Farm Systems Typology Analysis Coupled with Participatory Research: A Case for Smallholder Farmers in Myanmar. *Agriculture*, *11*(6), 516. https://doi.org/10.3390/agriculture11060516
Thorpe, J. (2018). Procedural justice in value chains through public–private partnerships. *World Development*, *103*, 162–175. https://doi.org/10.1016/j.worlddev.2017.10.004
Trienekens, J. H. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review*, *14*(2), 32.
Vanlauwe, B., Coe, R., & Giller, K. E. (2019). Beyond Averages: New Approaches to Un derstand Heterogeneity and Risk of Technology Success or Failure in Sammlholder Farming. *Experimental Agriculture*, *55*(S1), 84–106. https://doi.org/10.1017/S0014479716000193
Woolverton, A., & Neven, D. (2014). *Understanding smallholder farmer attitudes to commercialization – The case of maize in Kenya.* (p. 118). FAO. https://www.fao.org/family-farming/detail/en/c/273723/
World Bank. (2019). *Worldbank_2018_Working with smallholders: A handbook for Firms Building Sustainable Supply Chains*. The World Bank Group. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/handbook_working+with+smallholders
Wulandari, S., Djufry, F., & Villano, R. (2022). Coping Strategies of Smallholder Coffee Farmers under the COVID-19 Impact in Indonesia. *Agriculture*, *12*(5), 690. https://doi.org/10.3390/agriculture12050690
Zhu, Y., & Chen, J. (2022). Small-Scale Farmers' Preference Heterogeneity for Green Agriculture Policy Incentives Identified by Choice Experiment. *Sustainability*, *14*(10), 5770. https://doi.org/10.3390/su14105770

CHAPTER 6
Conclusions

6.1 Introduction

This chapter summarises the research findings and implications and concludes the overall thesis. Limitations of the study are discussed and recommendations for future research are presented.

6.2 Thematic integration

This thesis offers a novel and insightful perspective on the topical issue of sustainable value chain transformation in the agrifood sector of developing countries. The study exemplifies and confirms various challenges for a developing country agrifood value chain to embrace sustainable practice when transforming into higher value chains. The key challenges identified in the process of transforming from traditional practice to more advanced practices; a large number of smallholders, who are the key players with diverse characteristics and a lack of governance and value-adding practices; and value chain players who pose risks to sustainability as their economic orientation often neglects socio-environmental aspects. Papers presented in the thesis reflect a sequence of process, representing the sustainable value chain transformation. These papers are also complementary to one another and demonstrate a line of reasoning related to the study's objectives (section 1.6 of Chapter 1), with contributions detailed in Table 6.1.

Table 6. 1. Summary of research contribution

Chapters	Contributions	
	Theoretical Contribution	Practical Implications
Chapter 2: Concept paper: Sustainable agrifood value chain- Transformation in developing Countries	- Development of a framework to enable sustainable agrifood value chain transformation in developing countries by integrating three central dimensions: sustainability, governance, and value addition. - A systematic transformation approach to optimally organise actions and create a more effective route for sustainable agrifood value chain transformation in developing countries.	*Practitioners***:** The framework can assist value chain actors to self-assess and self-determine the transformation trajectories to fully align with higher value markets' requirements in sustainable practices *Policymakers***:** The framework guides policymakers, along with the public sector, in prioritising and tailoring their intervention to overcome barriers in the sustainable value chain transformation.
Chapter 3: Transforming agrifood value chains in developing countries	Development of maturity level assessment technique to tailor value chain's transformation route (based on governance and value addition)	*Practitioners:* Value chain players can self-investigate the current maturity level of practice and pave their potential steps to better integrate in the chain and transform their practices *Policymakers:* Policymakers can provide supports for the value chain players based on their maturity level of practice.
Chapter 4: Enabling sustainable agrifood value chain transformation in developing countries	Identification and prioritisation of factors that enable sustainable value chain practice, using empirical evidence in developing countries	*Practitioners:* Value chain players can investigate their transformational factors that fit to their practice and see how powerfully each factor supports the sustainable practice transformation. *Policymakers***:** This study contributes to clarifying which important activities should be addressed in the short- and long-term intervention to enable sustainable value chains practice.
Chapter 5: Assessing smallholders' heterogeneity toward sustainable agrifood value chain in developing countries	- Understanding of smallholders' typology in attaining sustainable value chain practice in developing countries' context - Finding the dominant characteristics that are compatible with higher value market and sustainability requirement	*Practitioners* & *Policymakers***:** The study provides clear advice and creates the groundwork for an effective intervention based on the characteristics of the smallholders' groups

In this study, combining agrifood value chain and sustainability approaches has been challenging from a theoretical standpoint regarding how and which relationship between dimensions may work, and where various systems can be applied in different ways. In order to facilitate and foresee the sustainable value chain transformation in developing countries, this study has found that a structure that integrates sustainability, governance, and value addition dimensions has provided a strong framework (presented in Chapter 2). More importantly, the development of a

theoretical framework was equipped with an operationalization procedure which emphasised the prioritisation of activities. An operational approach helps with defining the systems (the structures within relationships) and locating leverage points for changing the food system (Guptill & Peine, 2021). This study particularly suggests that there is much to learn about how sustainable value chain structure is implemented in the developing country agrifood sector, and that further research would benefit the literature in this area.

The empirical application in Indonesia's cashew sector (presented in Chapters 3-5) has confirmed some critical foundations for the sustainable value chain transformation process. Firstly, it has laid a solid basis and evidence that transformation cannot be viewed as an instantaneous movement, but rather as a path which requires a confluence of factors, vectors, and actors, in order to reach the sustainable value chain destination. It also improves understanding of how to gradually close the gap in practices between weak actors and powerful players in the chain in developing countries.

Secondly, the empirical study helps to reorient the theory of sustainable value chains in the context of developing countries. Based upon the findings, this study serves as an extension to the numerous prior studies regarding the players' practice in developing countries. They are often assumed to frequently overlook social-environmental aspects at the expense of economic profit (IFAD, 2013; Lindgreen et al., 2013; Vroegindewey & Hodbod, 2018) and the informality of smallholders' practice makes it difficult to enforce environmental regulations (FAO, 2014). The empirical findings of this study imply that the social-environmental aspect was not the main issue in developing countries, instead, the stumbling block likely continues to be the economic aspect. Smallholders were surprisingly found to have developed environmental and social sustainability practices in a culturally appropriate manner, although often without having a complete understanding of the sustainability concept. More refined awareness-raising actions and improved policy will be advantageous as the new strategy's focal point. The future strategy should develop maturity of practice in governance and value addition activities such as by expanding the markets, obtaining certifications, and delivering more value. Meanwhile, it is essential to preserve the current beneficial practice as an asset. The developing countries' value chain are unique in the traditional practice styles and players' characteristics, which should not be overlooked. A close examination of the smallholders' heterogeneity towards sustainable value chain practice revealed further fact that smallholders with high socio-economic characteristics do not always pursue sustainable value chain

practices and, similarly, smallholders with low socio-economic condition do not always have low intentions.

The approach presented in this study has provided a robust basis for operating and developing a sustainable value chain transformation mechanism needed by developing countries players and policymakers. They can gain better understanding of the mechanism of sustainable value chain practice development in the agrifood sector of developing countries in terms of transformation structure, prioritised factors, and prioritised actors, as integrated in Figure 6.1. Importantly, it offers a "bottom-up" strategy, where smallholders' perspectives are considered crucial to be in line with the value chain players.

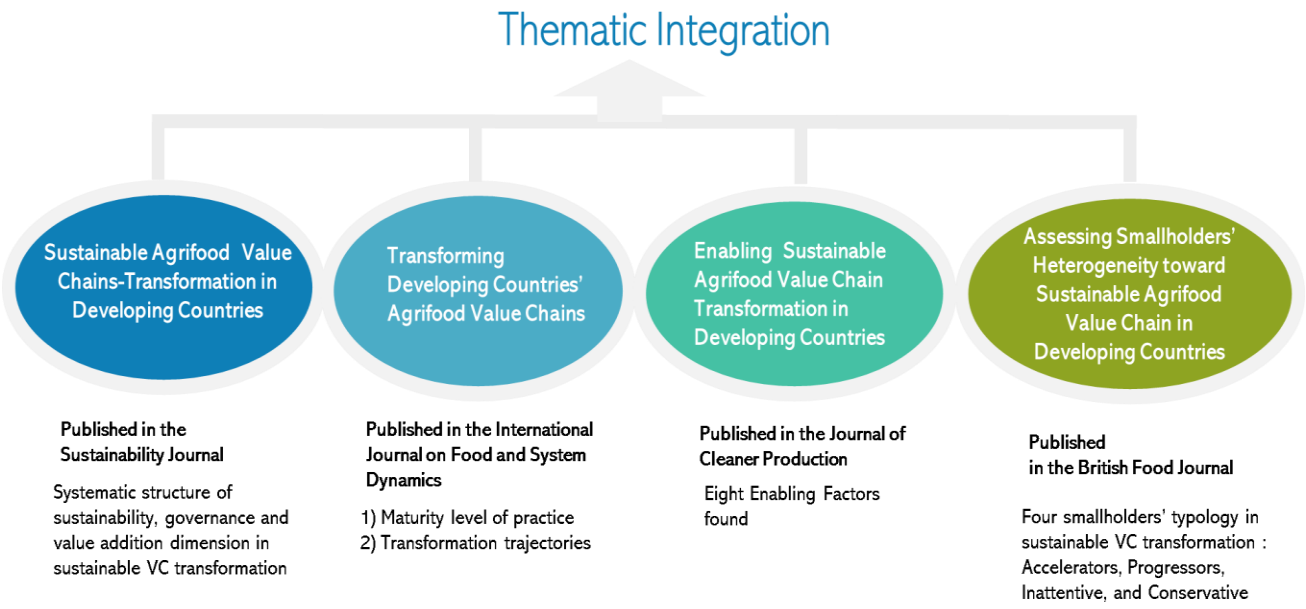


Figure 6. 1. Thematic integration of the study

Practitioners can not only self-investigate their current level of practise maturity but can also plan potential steps to better integrate their players, particularly smallholders, in order to move value chains into more sustainable practises. Policymakers can better assist value chain players by defining and clarifying which key activities and which type of players should be addressed in short- and long-term interventions to enable sustainable agrifood value chain practice. Additional research is required to complement this study in a variety of ways (i.e., exploration of other sectors, area, players, multi-disciplines, etc). Nonetheless, this study will assist the development of future insights on sustainable transformation investigation. Further research into the topic of sustainable value chains in the context of developing nations is merited as it is a global problem that will help to achieve the Sustainable Development Goals.

6.3 Limitations of this study

The study has some limitations, some of which are discussed in earlier chapters.

- Some respondents used the local language (Madurese language) in the interview process because of limited understanding of the Indonesian national language. When conducting research that involves language and cultural differences, there are obstacles with practical challenges and costs that are likely to be substantial (Bryman, 2012). A Madurese language translator (who was also an agribusiness student) and a key local person (who worked as an extension worker) were used to assist the interview.

- The generalisation problem is a common issue in a qualitative study. However, the qualitative goal in this study is to provide a rich and contextual understanding that can represent the general situation in the area, which can further facilitate the quantitative research. The need for exploratory studies arise when there is little information available (Halcomb, 2019). Key respondents were carefully chosen based on recommendations from experienced extension workers and agricultural institutions.

- The Covid pandemic restricted the field data collection procedure in the quantitative study and slowed the development of the thesis as a whole. Both Indonesia and New Zealand were in lockdown and international travel was prohibited. Consequently, the research method in terms of the data collection procedures was ethically redesigned using a remote-online data collection tool, hiring of surveyors, and Kobotoolbox software. The software used, Kobotoolbox, is a dependable one frequently used by the UNHCR, World Bank, UNESCO, and other well-known international organisations. The electronic questionnaire was developed and repeatedly tested (test with colleagues and key respondents by using zoom). Finally, the main data collection was accomplished successfully.

- The sample size was influenced by budget and time constraints. It was still linked to the pandemic situation, in which data collection necessitated more budget allocation such as the hiring and briefing of surveyors, as well as the provision of a health pack (mask, vitamins, etc). In addition, some partial lockdowns occurred, requiring surveyors to wait until the situation was safe. Furthermore, the Government does not keep a database of cashew farmers, and the cashew farmer population is unknown, which caused the survey process to become more challenging.

In this regard, the initial relationship established with key respondents in the pilot study helps to provide support during the main data collection process. As a result, data was gathered from a total of 159 respondents.

- The quantitative approach used a Likert scale to determine smallholders' orientation, which basically converted qualitative information into quantitative data. According to Kothari (2004), while there is a possibility of bias in the data provided by respondents, this weakness is addressed using a cumulative scale. Li (2013) also states that a Likert scale design with a sufficient range should aid in determining the clear state of response. A five-point Likert scale was set to simplify the respondents' choice and the surveyors also received extensive training to gather the required data.

- The quantitative study was designed using a smallholder-centric orientation, which may not be sufficient to understand the perspective of the entire value chain. Smallholders are the players at the beginning of the value chain stage, and their viewpoint needs to be aligned with that of other important players like key processors and exporters.

- Generalising the study's findings requires adjustments and modifications to accommodate the applications in different sectors or regions. For example, the cashew sector as perennial crop used in this study exhibits different level of perishability compared to seasonal crops like cassava or corn. Moreover, smallholders' practices in other developing countries, such as those in Africa may vary from those observed in Indonesia. Furthermore, certain findings in the study may require updates in the future, particularly regarding identified clusters, as they have potential to change over time.

6.4 Future research

Further research that addresses current study limitations and explores the key issues listed below, is critical to fully comprehend the sustainable value chain transformation mechanism in developing countries.

- Future research in a non-pandemic situation should improve the methodology setting such as an expansion of the research quality by providing a larger data set at a lower cost. The remote-

online data collection using Kobotoolbox software can be further used since it provided an effective and efficient procedure and robust results. The study design can also be scaled out and modified by looking into other commodities (annual or seasonal crops) or conducting research in other developing countries. Coffee and cocoa, for example, are vital high-value food products from developing countries' value chains (primarily in Asia and Africa) which are traded globally (IFAD, 2015; World Bank, 2019; WTO, 2019).

- Further research should look into the role of farmer groups, or cooperatives, in sustainable value chain transformations, especially with a mixed-farming base group. Smallholders in developing countries require cooperatives/farmer groups to function as an aggregate of players (Garnevska et al., 2011, 2014; Maspaitella et al., 2018), however, they frequently use their land for multiple purposes (e.g. multiple crops) (FAO, 2014). Under a small scale-size, the smallholders' focus may be dispersed and lost due to product variation.

- Exploring sustainable value chain transformation by aligning the perspectives of smallholders with those of other significant players in future research will also improve the accuracy of the mechanism's understanding. Once the perspectives of the value chain players are aligned, the integration and collaboration, as well as value-sharing, can be effectively managed. A multi-perspective approach is substantial to comprehending the dynamics of the agrifood chain at various scales in terms of power and relationship interplay (El Bilali, 2018; Rossi et al., 2019).

- This study has significantly contributed to the development of a sustainable value chain transformation concept, which can be expanded upon by employing other emerging approaches in the agrifood sector, such as the circular economy theory. The circular economy emphasises the rethinking of the use of material/inputs, maintaining resources and value through processes, reusing the products, and recycling activities (Langsdorf & Duin, 2022). According to Despoudi et al., (2021), moving from the linear chain into circular chain is important in order to achieve a sustainable value chain. However, the circular economy concept may provide a lot of room for discussion in the frame of a sustainable value chain, either contradictory or complementary in concepts. For example, in the context of developing countries, it is critical to discuss whether a closed or open-loop mechanism in the chain will be more advantageous to the players (Montag, 2022).

References of Chapter 6

Bryman, A. (2012). *Social research methods* (4th ed). Oxford University Press. https://dl1.cuni.cz › mod_folder › content › Bryman

Despoudi, S., Sivarajah, U., & Dora, M. (2021). *From Linear to Circular Food Supply Chains: Achieving Sustainable Change*. Springer International Publishing. https://doi.org/10.1007/978-3-030-72673-7

El Bilali, H. (2018). Transition Heuristic Frameworks in Research on Agro-Food Sustainability Transitions. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-018-0290-0

FAO. (2014). *Developing sustainable food value chains: Guiding principles*. FAO. http://www.fao.org/3/i3953e/i3953e.pdf

Garnevska, E., Joseph, H., & Kingi, T. (2014). Development and challenges of cocoa cooperatives in Papua New Guinea: Case of Manus province. *Asia Pacific Business Review*, *20*(3), 419–438. https://doi.org/10.1080/13602381.2014.931046

Garnevska, E., Liu, G., & Shadbolt, N. M. (2011). Factors for successful development of farmer cooperatives in Northwest China. *International Food and Agribusiness Management Review*, *14*(4), 69–84.

Guptill, A., & Peine, E. (2021). Feeding relations: Applying Luhmann's operational theory to the food system. *Agriculture and Human Values*, *38*(3), 741–752. https://doi.org/10.1007/s10460-020-10185-8

Halcomb, E. J. (2019). Mixed methods research: The issues beyond combining methods. *Journal of Advanced Nursing*, *75*(3), 499–501. https://doi.org/10.1111/jan.13877

IFAD. (2013). *Smallholders, food security, and the environment*. the International Fund for Agricultural Development (IFAD). https://www.ifad.org/documents/38714170/39135645/smallholders_report.pdf/133e8903-0204-4e7d-a780-bca847933f2e

IFAD. (2015). *Sustainable Inclusion of Smallholders in Agricultural Value Chain*. IFAD. https://www.ifad.org/documents/38714170/40264252/Scaling+up+note+-+Sustainable+inclusion+of+smallholders+in+agricultural+value+chains.pdf

Kothari, C. R. (2004). *Research Methodology: Methods & Techniques*. New Age International (P) Ltd., Publishers. https://dinus.ac.id/repository/docs/ajar/Kothari_-_Research_Methodology_Methods_and_Techniques_-_2004.pdf

Langsdorf, S., & Duin, L. (2022). *The circular economy and its impact on developing and emerging countries. An explorative study*. Ecologic Institute, Berlin. https://www.ecologic.eu/sites/default/files/publication/2022/50068-Circular-Economy-and-Developing-Countries-web.pdf

Li, Q. (2013). A novel Likert scale based on fuzzy sets theory. *Expert Systems with Applications*, *40*(5), 1609–1618. https://doi.org/10.1016/j.eswa.2012.09.015

Lindgreen, A., Maon, F., & Vanhamme, J. (Eds.). (2013). *Sustainable value chain management: A research anthology*. Gower.

Maspaitella, M., Garnevska, E., Siddique, M. I., & Shadbolt, N. (2018). Towards high value markets: A case study of smallholder vegetable farmers in Indonesia. *International Food and Agribusiness Management Review*, *21*(1), 73–88. https://doi.org/10.22434/IFAMR2017.0011

Montag, L. (2022). Circular Economy and Supply Chains: Definitions, Conceptualizations, and Research Agenda of the Circular Supply Chain Framework. *Circular Economy and Sustainability*. https://doi.org/10.1007/s43615-022-00172-y

Rossi, A., Bui, S., & Marsden, T. (2019). Redefining power relations in agrifood systems. *Journal of Rural Studies*, *68*, 147–158. https://doi.org/10.1016/j.jrurstud.2019.01.002

Vroegindewey, R., & Hodbod, J. (2018). Resilience of agricultural value chains in developing country contexts: A framework and assessment approach. *Sustainability*, *10*(4), 1–18. https://doi.org/10.3390/su10040916

World Bank. (2019). *Worldbank_2018_Working with smallholders: A handbook for Firms Building Sustainable Supply Chains*. The World Bank Group. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/handbook_working+with+smallholders

WTO. (2019). *Global Value Chain Development Report 2019: Technological Innovation, Supply Chain Trade, and Workers in A Globalized World*.

APPENDICES

Appendix A. Questionnaires

Appendix A1. Pilot study questionnaires

Interview Protocol:

1. Introduction of self to the respondent
2. Introduction the interview purpose:
   a. Gathering information, understanding and mapping cashew nut value chain (general structure, value addition, business culture and stakeholders) in Indonesia, particularly in Madura Island
   b. To explore the sustainable agri-food value chain transformation information from key stakeholders of cashew nut in Madura Island
3. Explanation about the expectation to hear about respondent experience, role or information in undertaking the cashew nuts related activities, how confidentially will be maintained and requirement for recording permission.
4. Interview Process Part I-IV (depend on the respondent categories)
5. Closing

Questionnaire (Pilot Study)
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 01	: Farmer
Respondent	: O1-

I. Farmer characteristics (1-2 minutes)

1. What is your name?
2. What is your age?
3. What is your main job?
4. What is your education background?
5. How many family members do you have? (Explore whether they support farm work)
6. How long have you experienced the cashew farming?
7. Why do you plant cashew nuts?

II. Farm characteristic (8-10 minutes)

1. What is your farm size? (Check land ownership status)
2. What is your cashew plants type? (explore why using this type)
3. How many commodities in your farm? (explore the percentage estimation of cashew nuts plants compared to others)
4. How is the cashew farm productivity (include production)?
5. How is the income from others crop or job (depend on the situation)?

III. Value addition in agrifood farm (±15 minutes)

1. Production

1. How do you arrange the input on the cashew farm? (explore the preparation i.e. the soil, fertilizer, pesticide, water)
2. How do you practice the cashew farm activities? (explore the reason, use of local method, tools & labour)

2. Harvesting and post-harvesting

1. How do you harvest the cashew nuts? (Explore the practice and the frequency of harvesting within reasoning)
2. How do you arrange the cost of harvesting?
3. How do you deal with the product loss and waste during harvesting?
4. How do you store the cashew nuts? (explore the method, time and perishability)
5. How do you treat the cashew nuts? (explore method, safety, quality, and certification if any)

3. Cashew nuts marketing

1. How do you sell cashew nuts? (explore the buyer, market, and relationships)*
2. How is the transaction arrangement? (explore in terms of contract term, negotiation, cost within impact)
3. How the buyers understand the cashew nuts quality?
4. What is the cashew nuts price?

5. How is the cashew price arrangement? (explore the price setting and payment method)
6. How is the cashew nut selling volume arrangement? (explore volume within one year)
7. How do you access market information? (explore information relevant to price, quality, buyers and informant, within the challenges)
8. What are the challenges to find market information?
9. How do you access other supporting information for your cashew farm activities? (explore government, financial, or others, within the challenges)

*Lead to next respondent stage: name, address and contact number required if possible

IV. Institution (2-3 minutes)

1. Who are key stakeholders supporting cashew production activities? (explore the role of extension workers and other stakeholders in relevant to financial, subsidy, etc.)
2. Are you a member of farmer group or cooperatives?
3. What are benefits from the membership?
4. Is there any other institution helped your cashew farm activities? (explore whether NGO have intervened the cashew farm activities)

V. Potency of sustainable agrifood value chain transformation (±15 minutes)

1. What changes have happened in your cashew farm (explore the difference on previous and current practice in terms of production, harvesting or post harvesting)? How is the impact of changes (i.e cost or quantity of production)?
2. Which activities that you will improve in the future? (explore the reason)
3. What are the barriers/challenges to improve your cashew farm business? (explore both internal and external challenges within the reason)
4. Which parties can support you to improve the cashew business (explore whether government, cooperative, firms, others, within the support expectation)
5. Have you heard about Sustainable Development Goals (SDGs) or sustainability? (explore understanding)
6. Who is the significant cashew nuts player in this area (i.e. buyer, industry, or exporter in Madura Island)?

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing

Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Questionnaire (Pilot Study)
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 02	: Intermediaries/Wholesaler
Respondent	: 02-

I. Identity (1 minute)

1. What is your name?
2. What is your age?
3. What is your main job?
4. How long have you experience in cashew nuts trade?
5. Why do you choose cashew nuts trading?

II. Cashew sourcing activities (8-10 minutes)

1. Where is your main sourcing/producer area? (explore main source of cashew nuts within the reason)
2. How do you arrange sourcing volume per season/moth/etc? (explore per year volume)
3. What is the average price in buying cashew nuts?
4. Who set the price in transaction?
5. How do you arrange the quality of cashew nuts that you buy? (explore certification if any)
6. Who sets the quality?
7. How do you arrange transaction with supplier/farmers? (Explore transaction term and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)

III. Cashew processing before marketing (8-10 minutes)

1. How do you treat cashew nuts before selling? (explore storing, packing, etc)
2. Who treats the cashew nuts? (explore labour using, skill and knowledge, etc)
3. How do you arrange cashew nuts quality (include safety) within price? (explore certification if any)
4. How is the risk of loss and waste during processing/treatment? (explore the handling method)
5. How is the average cost in cashew processing?

IV. Cashew nuts marketing (10-15 minutes)

1. Who is/are your buyer/s? (explore main buyer within the reason and selling frequency)*
2. How do you arrange marketing volume per season/moth/etc? (explore per year volume)
3. What is the average price in cashew nuts selling?
4. Who set the price in transaction?
5. How do you arrange the quality in cashew nuts selling?
6. Who sets the quality?
7. How do you arrange transaction with buyer? (Explore transaction term and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)
9. How do you access market information? (Explore in relevant to price, quality and buyer)
10. What are the challenges to obtain the information?
11. How do you access other information in order to support your cashew business (i.e. government support, finance support, ect)? (Explore the challenges)

*Lead to next respondent stage: name, address and contact number required if possible

V. Institutional (1 minute)

Who are key stakeholders supporting your cashew business? (explore the role of government/NGO/other)

VI. Potency of sustainable agrifood value chain transformation (8-10 minutes)

1. What changes have happened in your cashew business (explore the difference on previous and current practice in sourcing, processing or marketing)
2. How is the impact of changes (i.e cost or quantity of production)?
3. Which activities that you will improve in the future? (explore the reason)
4. What are the barriers/challenges to improve your cashew farm business? (explore both internal and external challenges within the reason)
5. Which parties can support you to improve the cashew business (explore whether government, cooperative, firms, others, within the support expectation)
6. Have you heard about Sustainable Development Goals (SDGs) or sustainability? (explore understanding)
7. Who is the significant cashew nuts player in this area (i.e. buyer, industry, or exporter in Madura Island)?

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing

Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Questionnaire (Pilot Study)
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 03	: Processors
Respondent	: 03-

I. Identity (1 minute)

1. What is your name?
2. What is your position in the company/ business? (Explore the role)
3. How long have you experience in cashew nuts trade?
4. Why do you enter cashew nuts business?

II. Cashew sourcing activities (8-10 minutes)

1. Who is/are your suppliers? (explore main suppliers of cashew nuts within the reason)
2. How do you arrange sourcing volume per season/moth/etc? (explore per year volume)
3. What is the average price in buying cashew nuts?
4. Who set the price in transaction?
5. How do you arrange the quality of cashew nuts that you buy? (explore certification if any)
6. Who sets the quality?
7. How do you arrange transaction with supplier/farmers? (Explore transaction term and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)

III. Cashew processing before marketing (8-10 minutes)

1. How do you treat cashew nuts before selling? (explore storing, packing, etc)
2. Who treats the cashew nuts? (explore labour using, skill and knowledge, etc)
3. How do you arrange cashew nuts quality (include safety) within price? (explore certification if any)
4. How do you handle the risk of loss and waste during processing/treatment? (explore the handling method)
5. How is the average cost in cashew processing?

IV. Cashew nuts marketing (10-15 minutes)

1. Who is/are your buyer/s? (explore main buyer within the reason and the selling frequency)*
2. How do you arrange marketing volume per season/moth/etc? (explore per year volume)
3. What is the average price in cashew nuts selling?
4. Who set the price in transaction?
5. How do you arrange the quality in cashew nuts selling?
6. Who sets the quality?
7. How do you arrange transaction with buyer? (Explore transaction term and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)
9. How do you access market information? (Explore in relevant to price, quality and buyer)
10. What are the challenges to obtain the information?
11. How do you access other information in order to support your cashew business (i.e. government support, finance support, ect)? (Explore the challenges)

*Lead to next respondent stage: name, address and contact number required if possible

V. Institution

Who are key stakeholders supporting your cashew business? (explore the role of government/NGO/other)

VI. Potency of sustainable agrifood value chain transformation (8-10 minutes)

1. What changes have happened in your cashew business (explore the difference on previous and current practice in sourcing, processing or marketing)
2. How is the impact of changes (i.e cost or quantity of production)?
3. Which activities that you will improve in the future? (explore the reason)
4. What are the barriers/challenges to improve your cashew processing business? (explore both internal and external challenges within the reason)
5. Which parties can support you to improve the cashew processing business (explore whether government, cooperative, firms, others, within the support expectation)
6. Have you heard about Sustainable Development Goals (SDGs) or sustainability? (explore understanding)
7. Who is the significant cashew nuts player in this area (i.e. buyer, industry, or exporter in Madura Island)?

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing

Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Questionnaire (Pilot Study)
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 04	: Cooperative/farmer Group ……
Respondent	: 04-

I. Identity (1-2 minutes)

1. What is your name?
2. What is your position in this organisation? Please describe your role

II. Cooperative/farmer group role (30-45 minutes)

1. When was this organisation established? (explore the reason)
2. How long have this organisation experience in the cashew activities?
3. How the organisation plays the role in cashew nuts activities? (explore input, market, training, information, finance or other service,) *if similar to those intermediaries, use questionnaire code 2
4. How many memberships in this organisation? (Explore how the members play their role in cashew activities)
5. How is the rule to enter and exit the membership?
6. What are the challenges faced by this organisation to support the cashew nuts activities?
7. What are the opportunities to support the cashew nuts activities?
8. How to improve towards sustainable cashew nuts value chain practice from cooperative/farmer group point of view?
9. Have you heard about Sustainable Development Goals (SDGs) or sustainability? (explore understanding)

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing
Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Questionnaire (Pilot Study)
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 05	: Exporter…..
Respondent	: 05-

I. Identity (1-2 minutes)

1. What is your name?
2. What is your position in this exporting company? Please describe your role
3. How long have this company experience in cashew nut business?
4. Why does this company enter cashew nut business?
5. How is the percentage of cashew nut business compared to other products?

II. Cashew sourcing (10-15 minutes)

1. Who is/are your suppliers? (explore main suppliers of cashew nuts within the reason)
2. How do you arrange sourcing volume per season/moth/etc? (explore per year volume)
3. What is the average price in buying cashew nuts?
4. Who set the price in transaction?
5. How do you arrange the quality of cashew nuts sourcing? (explore certification if any)
6. Who sets the quality?
7. How do you arrange transaction with supplier/farmers? (Explore transaction term and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)

III. Cashew processing before export (10-15 minutes)

1. How do you treat cashew nuts before exporting? (explore storing, packing, etc)
2. Who treats the cashew nuts? (explore labour using, skill and knowledge, etc)
3. How do you arrange cashew nuts standards processing (quality, safety and price) before exporting? (explore certification and standard of targeted countries, if any)
4. How do you handle the risk of loss and waste during processing/treatment? (explore the handling method)
5. How is the average cost in cashew processing?
6. What are the weaknesses and benefits of Indonesian products compared to other countries?

IV. Cashew nuts marketing (10-15 minutes)

1. Where are the export market countries? (explore the reason)
2. How do you arrange the export frequency?
3. How do you arrange the price, quality and quantity based on the market (explore negotiation process and the export market requirement)
4. How does the domestic regulation play a role in the export activities?
5. How do you arrange various demand from different countries along with their requirements?
6. Which countries have the potency as market?
7. How do you arrange transaction with the supplier (explore relationship terms i.e. contract and form)
8. How does the current transaction system impact your cashew business? (explore the cost, easiness, etc)

V. Potency of sustainable agrifood value chain transformation (8-10 minutes)

1. What changes have happened in your cashew business (explore the difference on previous and current practice in sourcing, processing or marketing)
2. How these changes impacted the business (i.e cost or quantity of production)?
3. Which activities that you will improve in the future? (explore the reason)
4. What are the barriers/challenges to improve your cashew export business? (explore both internal and external challenges within the reason)
5. Which parties can support you to improve the cashew business (explore whether government, cooperative, firms, others, within the support expectation)
6. Have you heard about Sustainable Development Goals (SDGs) or sustainability? (explore understanding)
7. Have you identified other exporters that sourced from around Madura Island?

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing

Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Questionnaire Pilot Study
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 06	: Government……
Respondent	: 06-

I. Identity (1-2 minutes)

1. What is your name?
2. What is your position? Please describe your role
3. How long have you experience in cashew-related division?

II. Institution role (30-45 minutes)

1. How does this institution play the role of in the cashew sector? (Explore the authorities in programs related to cashew nuts development)
2. Does this institution archived documents (secondary data) related to below information.
   a. Policies/program in cashew sector that had been implemented (Explore the program implementation in terms of location, persons, impact and evaluation)
   b. Future programs in cashew sector (Explore the plan of program implementation in terms of location, persons, impact and evaluation)
3. What have been the challenges in the cashew sector development? (explore the social, economic and environment aspects)?
4. What are the opportunities in the cashew sector development? (explore the social, economic and environment aspects)
5. How the Sustainable Development Goals (SDGs) plays a role in cashew sector (if any)?

Additional information

1. Please let me know whether there is any missing important information I need to know
2. How do you feel about the interview session and feel free to provide any suggestion.

Closing
Thank-you for your time and information sharing. I will briefly summarize the information, and I would like to ask your kind permission to contact again to clarify any further information if needed in the future.

Appendix A2. Main data collection questionnaire

Questionnaire
Main Data Collection
Sustainable Agrifood Value Chain Transformation in Developing Countries

Code 01	: Farmer
Respondent	: 01 –
Sub District	: .....
Village	: .....

1. Cashew Farmer Demography

Please answer the following questions based on your current situation.

1. What is your name? .....
2. What is your gender?
   ☐ a. Male ☐ b. Female
3. What is your age?
   ☐ a. < 17 years ☐ b. 17-35 years ☐ c. >35-60 years ☐ d. Over 60 years
4. How many main family members do you have? ..... Person/s
5. What is your highest level of education?
   ☐ a. No Education/Not Finished Primary ☐ b. Primary School ☐ c. Junior High School ☐ d. Senior High School ☐ e. Tertiary
6. How long have you been working in cashew farming (approximately)?
   ☐ a. Less than 2 years ☐ b. > 2-5 years ☐ c. >5-10 years ☐ d. Over 10 years

2. Cashew Farm Type

Please answer the following questions that have been relevant to your cashew farm type within the last two years (around 2019-2020).

1. What is your total farm size? .....
2. Do you have inherited cashew trees?
   ☐ a. Yes (*Go to question no 3 -4*)
   ☐ b. No (*Go to question no 5*)
3. How many inherited cashew trees do you have? .....trees
4. What is the average total production of inherited cashew trees per year? .....Kg/year
5. Do you have cashew trees from the Government grant?
   ☐ a. Yes (*Go to question no 6 -7*)
   ☐ b. No (*Go to question no 8*)
6. How many cashew trees from the Government grant do you have? .....trees
7. What is the average total production of cashew trees from the Government grant per year? .....Kg/year
8. What is your cashew farm arrangement?
   ☐ a. Single cashew farm (Single crop) *(Finish this section*)
   ☐ b. Mixed-farming (Hedgerow arrangement) (*Go to question no's 9 and 10*)
9. What is another/other crop/s in your cashew farm?
   ☐ a. Corn .....land size ☐ b. Paddy .....land size ☐ c. Others (Please specify) .....land size
10. Why do you cultivate another crop/other crops along with cashews?
    ☐ a. As additional Income ☐ b. As main Income

3. Cashew Production Activities

3.1 Current Practice

Please mark the below statements that are relevant to your cashew production activities over the last two years (during 2019/2020).

1. Do you rejuvenate the old (inherited) cashew trees?
   ☐ a. Yes (*Go to question no2*)
   ☐ b. No (*Go to question no 3*)

2. What do you apply in rejuvenation?

☐ a. seeds from Government grant ☐b. Your own cashew seeds

3. Do you weed the cashew farm?

☐ a. Yes (*Go to question no 4*)

☐ b. No (*Go to question no 5*)

4. What do you apply in weeding activities?

☐ a. Manual Sickle ☐ b. Herbicide ☐ c. Others (Please specify) ……

5. Do you apply fertilizer on the cashew farm?

☐ a. Yes (*Go to question no 6*)

☐ b. No (*Go to question no 7*)

6. What type of fertilizer do you apply on the cashew farm?

☐ a. Manure ☐ b. Chemical Fertilizer ☐ c. Organic fertilizer from store

7. Do you control pest and disease on the cashew farm?

☐ a. Yes (*Go to question no 8*)

☐ b. No (*Go to question no 9*)

8. What do you apply to control pest and disease on the cashew farm?

☐ a. Smoke cashew tree (Foliage trash burning) ☐ b. Pesticide ☐ c. Other (Please specify) ……

9. Do you prune the cashew trees?

☐ a. Yes (*Go to question no 10*)

☐ b. No (*Go to question no 11*)

10. How often do you prune the cashew trees?

☐ a. Regularly after harvesting ☐b. When time is available ☐ c. When there are any distressed branches

11. What method do you apply in harvesting on the cashew farm?

☐ a. Pole method ☐b. Climbing method ☐ c. Cone up method ☐ d. Others (Please specify) ……

12. How do you utilize the cashew apples?

☐ a. No use (throwing at farm) ☐ b. As animal food ☐ c. As self-consumption ☐ d. Selling to the market ☐ d. Others (Please specify)…

13. Do you apply a hedgerow planting agreement with the neighbourhood farm owner?

☐ a. Yes (*Go to question no 14*)

☐ b. No (*Go to question no 15*)

14. How do you apply the hedgerow planting agreement?

☐ a. Sharing harvesting right ☐ b. Redeeming conflict ☐ c. Other (Please specify) ……

15. Are you self-employed?

☐ a. Yes (*Go to question no 16*)

☐ b. No (*Go to question no 17*)

16. What is your employment status?

☐ a. Paid ☐ b. Unpaid

17. Do you employ any family members on thet cashew farm?

☐ a. Yes (*Go to question no 18-19*)

☐ b. No (*Go to question no 20*)

18. How many famiy members work on your cashew farm? ….person

19. What is the employment status of your family member/s?

☐ a. Paid ☐ b. Unpaid

20. Do you employ other people (non-main family member) on the cashew farm?

☐ a. Yes (*Go to question no 21-22*)

☐ b. No (*Finish this section*)

21. How many people (non-famiy members) work at your cashew farm? ……person/s

22. What is the employment status of the non-family member?

☐ a. Paid ☐ b. Unpaid ☐c. Others (Please specify, i.e mutual help) ……

(*Finish this section*)

3.2 Future Orientation

Please mark your level of agreement with the following statements by using SDA (Strongly Disagree), DA (Disagree), NS (Not Sure), A (Agree), and Strongly Agree (SA).

In the next 2-3 years, it is likely that you ……	SDA	DA	NS	A	SA
1. Will rejuvenate cashew farm by using seeds from Government grant.	☐	☐	☐	☐	☐
2. Will use your own cashew seeds to rejuvenate old cashew trees.	☐	☐	☐	☐	☐
3. Will weed the cashew farm by using a manual sickle.	☐	☐	☐	☐	☐
4. Will apply more herbicide to weed the cashew farm.	☐	☐	☐	☐	☐
5. Will apply more manure on the cashew farm.	☐	☐	☐	☐	☐
6. Will apply more chemical fertilizer on the cashew farm.	☐	☐	☐	☐	☐
7. Will control any pest and disease by smoking the cashew farm.	☐	☐	☐	☐	☐
8. Will apply more pesticide on the cashew farm.	☐	☐	☐	☐	☐
9. Will prune the cashew farm more regularly after harvesting.	☐	☐	☐	☐	☐
10. Will focus on harvesting the ripened nuts.	☐	☐	☐	☐	☐
11. Will utilize ripened cashew apples as an additional income.	☐	☐	☐	☐	☐
12. Will use the cone harvesting method.	☐	☐	☐	☐	☐
13. Will buy modern tools for cashew cultivation.	☐	☐	☐	☐	☐
14. Will buy modern tools for cashew harvesting.	☐	☐	☐	☐	☐
15. Will maintain the hedgerow agreement.	☐	☐	☐	☐	☐
16. Will provide a better payment to employees.	☐	☐	☐	☐	☐
17. Will provide a better payment for family labour.	☐	☐	☐	☐	☐
18. Will employ more non-family members as labour.	☐	☐	☐	☐	☐

19. What are the 3 priorities that you will confidently apply in the next 2-3 years at the cashew farm.

☐ a Rejuvenating
☐ b. Weeding
☐ c. Fertilizing
☐ d. Controlling Pest and Disease
☐ e. Pruning
☐ f. Harvesting ripe nuts
☐ h. Employing more people

4. Cashew Nuts Marketing

4.1 Current Practice

Please answer the following questions based on your cashew nuts' marketing activities within the last 2 years (2019/2020).

1. What are your cashew products (within the estimated volume)?	2. Who buy your cashew nuts?	3. How many (Kg) - the approximate volume - do you sell?	4. What is the average sale price (Rp/Kg)?
☐ Wet in shell nuts _____Kg	☐ 1) Small-scale Intermediaries ☐ 2) Cashew Centre/main wholesaler ☐ 3) Other Wholesalers ☐ 4) Farmer Group ☐ 5) Other (Please specify)…	1) ….. 2) ….. 3) ….. 4) ….. 5) …..	1) ….. 2) ….. 3) ….. 4) ….. 5) …..
☐ Dry in shell nuts _____ Kg	☐ 1) Small-scale Intermediaries ☐ 2) Cashew Centre/main wholesaler ☐ 3) Other Wholesalers ☐ 4) Farmer Group ☐ 5) Other (Please specify)	1)….. 2) ….. 3) ….. 4) ….. 5) …..	1)….. 2)….. 3)….. 4)….. 5)…..
☐ Shelled cashew nuts _____ Kg	☐ 1) Small-scale Intermediaries ☐ 2) Cashew Centre/main wholesaler ☐ 3) Other Wholesalers ☐ 4) Farmer Group ☐ 5) Other (Please specify)…	1) ….. 2) ….. 3) ….. 4) ….. 5) …..	1)….. 2)….. 3)….. 4)….. 5)…..
☐ Ready to-Eat Product _____ Kg	☐ 1) Small-scale Intermediaries ☐ 2) Cashew Centre/main wholesaler ☐ 3) Other Wholesalers ☐ 4) Farmer Group ☐ 5) Other (Please specify)	1)….. 2) ….. 3) ….. 4) ….. 5) …..	1)….. 2)….. 3)….. 4)….. 5)…..

5. Do you grade your cashew nuts before selling?
   - ☐ a. Yes (*Go to question no 6*)
   - ☐ b. No (Go *to question no 7*)
6. How do you grade the cashew nuts?
   - ☐ a. Based on colour ☐ b. Based on size ☐ c. Other (Please specify) ……
7. Why don't you grade the cashew nuts before selling?
   - ☐ a. No difference in price ☐ b. No time ☐ c. Other (Please specify) ……
8. Do you sell cashew nuts to the same buyers every year?
   - ☐ a. Yes (*Go to question no 9*)
   - ☐ b. No (Go *to question no 10*)
9. Why do you sell cashew nuts to the same buyers?
   - ☐ a. Provide the highest price ☐ b. The easiest way to sell ☐ c. Other (Please specify) ……
10. Why do you sell to different buyers?
    - ☐ a. To get the highest price ☐ b. To be flexible in selling ☐ c. Other (Please specify) ……
11. Where do you mostly do your transactions?
    - ☐ a. At the farm gate ☐ b. At marketplace/buyer's place
12. How do you mostly transport cashew nut products?
    - ☐ a. by bicycle ☐ b. by motorbike ☐ c. by using pick-up vehicle/car
13. Do you seek cashew price information before selling?
    - ☐ a. Yes (*Go to question no 14*)
    - ☐ b. No (Go *to question no 15*)
14. How do you find cashew price information?
    - ☐ a. By carrying samples at marketplace/buyers ☐ b. By phone contact to others/buyers ☐ c. from neighbourhood
15. Why don't you seek cashew nut price information?
    - ☐ a. No need ☐ b. No facilities ☐ c. Others(Please specify) ……
16. How do you mostly decide the cashew nut price?
    - ☐ a. Accept cashew nut price set by the buyers ☐ b. Negotiate with the buyers ☐ c. Other (Please specify) ……

17. With whom do you mostly share cashew price information?

☐ a. No one ☐b. Neighbourhood farmers ☐c. Other (Please specify)….

18. How do you help your neighbourhood in cashew marketing?

☐ a. No helping activities ☐b. Mutual help with your neighbourhood farmers (i.e. to pack, carry, etc.) ☐c. Other (Please specify) ……

19. Do you allocate your cashew income to support your community?

☐ a. No allocation ☐b. Yes, by 'Shodaqoh' (charity) at mosque/poor neighbourhood. ☐c. Others (Please specify) ……

20. What do you think about the cashew nus income in fulfilling your family needs?

☐ a. Not adequate ☐b. Adequate ☐c. Other (Please specify) ……

4.2 Future Orientation

Please mark your level of agreement on the following statements by using SDA (Strongly Disagree), DA (Disagree), NS (Not Sure), A (Agree), and Strongly Agree (SA).

In the next 2-3 years, it is likely that you….	STS	TS	TY	S	SS
1. Will increase the amount of cashew nut grading to get a better price.	☐	☐	☐	☐	☐
2. Will increase the amount of dry cashew nut products to get a better price.	☐	☐	☐	☐	☐
3. Will increase the amount of shelled cashew nut products to get a better price.	☐	☐	☐	☐	☐
4. Will process cashew nuts into a ready-to-eat product to get a better price.	☐	☐	☐	☐	☐
5. Will sell the cashew nuts by focusing on farmgate transaction/at home.	☐	☐	☐	☐	☐
6. Will sell the cashew nuts by focusing on market/buyer's place transaction.	☐	☐	☐	☐	☐
7. Will find new buyers.	☐	☐	☐	☐	☐
8. Will find price information from various types of buyers.	☐	☐	☐	☐	☐
9. Will use a digital tool (such as a handphone) to obtain faster information from buyers.	☐	☐	☐	☐	☐
10. Will negotiate cashew nut price to get a better income.	☐	☐	☐	☐	☐
11. Will consider a fixed-price contract with buyers.	☐	☐	☐	☐	☐
12. Will share price information with a broader range of farmers.	☐	☐	☐	☐	☐
13. Will help neighbourhood farmers who need marketing activities' support (i.e. to pack, carry, etc).	☐	☐	☐	☐	☐
14. Will allocate more '*shodaqoh*' (charity) for mosque/poor community.	☐	☐	☐	☐	☐
15. Will provide informal loan for neighbours with financial shortage.	☐	☐	☐	☐	☐
16. Will improve children's/family education.	☐	☐	☐	☐	☐
17. Will improve family lifestyle.	☐	☐	☐	☐	☐

5. Certification Status

5.1 Current Practice

1. Do you currently have cashew farming certification from the Department of Agriculture?

☐ a. Yes (*Go to question no 2*)

☐ b. No (Go *to question no 3*)

2. Which type/s of certification do you have?

☐ a. Organic Farming ☐b. Good Agricultural Practice (GAP) ☐c. Other (Please specify) ……

3. When did you get the certification?

4. Why do you certify the cashew farm?
Finish this section and continue with question 5.2.A

5. Why don't you certify the cashew farm?
   - ☐ a. Lack of information (don't know)
   - ☐ b. Expensive
   - ☐ c. Complicated procedures
   - ☐ d. Not beneficial
   - ☐ e. Other (Please specify i.e. not interested) ……

Finish this section and continue with question 5.2.B

5.2 Future Orientation

Please mark your level of agreement on the following statements by using SDA (Strongly Disagree), DA (Disagree), NS (Not Sure), A (Agree), and Strongly Agree (SA).

5.2. A. Future Orientation of Certified Farming

In the next 2-3 years, it is likely that you …	STS	TS	TY	S	SS
1. Will maintain your certification.	☐	☐	☐	☐	☐
2. Will get another certification.	☐	☐	☐	☐	☐

5.2 B Future Orientation of Non-certified Farming.

In the next 2-3 years, you intend to get certification….	SDA	DA	NS	A	SA
1. If there is any information.	☐	☐	☐	☐	☐
2. If there is any training support.	☐	☐	☐	☐	☐
3. If there is any financial support.	☐	☐	☐	☐	☐
4. If there is an easy and simple procedure.	☐	☐	☐	☐	☐

6. Coordination with Other Smallholders

6.1 Current Practice

Please answer the following questions based on your coordination activities with other smallholders at the farmers' group.

1. Are you currently a member of a farmers' group?
   - ☐ a. Yes (*Go to question no 2-3*)
   - ☐ b. No (Go *to question no 4*)
2. What is the farmers' group name? ……
3. Which type of activities that the farmers' group supports in your cashew farming activities?
   - ☐ a. Obtains input subsidy (i.e seed and fertilizer) from Government
   - ☐ b. Accesses cashew processing tool subsidy from Government
   - ☐ c. Gets credit/loan access for your cashew farm
   - ☐ d. Sells cashew nuts collectively
   - ☐ e. Shares information about cashew farming improvement
   - ☐ f. Shares cashew price information
   - ☐ g. Supports other non-cashew farming activities (i.e. corn and paddy)

Finish this section and continue with question 6.2.A

4. Why are you not a member of a farmers' group?

- ☐ Not specific to cashew nuts
- ☐ Complicated registration procedures
- ☐ Not beneficial enough for you
- ☐ Too expensive to join membership
- ☐ Others (Please specify i.e. don't know how to become a member) ……

Finish this section and continue with question 6.2.B

6.2 Future Orientation

Please mark your level of agreement with the following statements by using SDA (Strongly Disagree), DA (Disagree), NS (Not Sure), A (Agree), and Strongly Agree (SA).

6.2. A. Future Orientation of Farmer Group Member

	SDA	DA	NS	A	SA
In the next 2-3 years you will likely maintain farmer group membership.	☐	☐	☐	☐	☐

6.2.B. Future Orientation of Non-Farmer Group Member

	SDA	DA	NS	A	SA
In the next 2-3 years you will likely become a member of a farmers' group.	☐	☐	☐	☐	☐

7. Coordination with Stakeholders

71. Current Status

Please mark the following statements which are relevant to your coordination with stakeholders.

1.Have you participated in any cashew training?

- ☐ Yes (*Go to question 2 & 3*)
- ☐ No (*Go to question 4*)

2. What was/were the cashew training theme/s?

☐ a. Farm production ☐ b. Processing ☐ c. Marketing ☐ d. Other (Please specify) ……

3. Who organised the cashew training/s?

☐ a. Extension Workers/Government ☐ b. NGO and/or University ☐ c. Other (Please specify i.e. farmers' group or buyer) ……

4. Why haven't you participated in any cashew training?

☐ a. Lack of information (don't know) ☐ b. Not beneficial for you ☐c. Busy ☐ d. Other (Please specify i.e. not interested)…

5.Have you received any support?

- ☐ Yes (*Go to question 6 & 7*)
- ☐ No (*Finish this section*)

6. Who provided the supporting program/s?

- ☐ a. Extension Workers/Government
- ☐ b. Non-Government Organisation/NGO
- ☐ c. Other (Please specify) ……

7.Which type of support?

- ☐ a. Input subsidy
- ☐ b. Tool processing subsidy
- ☐ c. Financial/Money support
- ☐ d. Low interest loan/credit
- ☐ e. New market/buyers' channel
- ☐ f. Information-Communication with expert channel
- ☐ g. Other (Please specify) ……

Finish this section

7.2 Future Orientation

Please mark your level of agreement on the following statements by using SDA (Strongly Disagree), DA (Disagree), NS (Not Sure), A (Agree), and Strongly Agree (SA).

In the next 2-3 years, it is likely that	STS	TS	TY	S	SS
Participating					
1. Training in cashew production will help you to learn more about cashew farming.	☐	☐	☐	☐	☐
2. Training in cashew processing will help you advance cashew nut treatment.	☐	☐	☐	☐	☐
3. Training in cashew marketing will help you improve cashew nut selling.	☐	☐	☐	☐	☐
4. *Please rank the above training based on your priority (1-3).*					
Supporting program in the form of					
5. Input subsidy will help you improve cashew farming activities.	☐	☐	☐	☐	☐
6. Processing tool subsidy will help you advance cashew nut treatment.	☐	☐	☐	☐	☐
7. Loan/credit with low interest will help you develop cashew farming activities.	☐	☐	☐	☐	☐
8. Financial support will help you develop cashew farming activities.	☐	☐	☐	☐	☐
9. Connection to new buyers will help you expand the cashew product market.	☐	☐	☐	☐	☐
10. Information sharing with experts will help you improve cashew farming practices.	☐	☐	☐	☐	☐
11. *Please rank the above programs based on your priority (only 3 priorities).*					
Support from					
12. Extension officers/Government will help you develop cashew farming activities.	☐	☐	☐	☐	☐
13. NGO/Non-Government Organisation will help you develop cashew farming activities.	☐	☐	☐	☐	☐
14. *Please rank the above support providers based on your preference (1-2)*					

8. How is the Covid pandemic affecting your cashew farming activities over 2020 and 2021? .....
9. How is the Covid pandemic affecting your cashew marketing over 2020 and 2021? .....
11. Any comments/additional information about your cashew nut orientation in the future? .....

Closing

Thankyou for your time and information sharing. I would like to ask your kind permission to contact you again to clarify any further information if needed in the future.

Appendix A3. Research ethic approval

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 02 December 2019

Dear Ratna Hidayati

Re: Ethics Notification - **4000022019** - **Sustainable Agri-Food Value Chain Transformation in Developing Country**

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

If situations subsequently occur which cause you to reconsider your ethical analysis, please contact a Research Ethics Administrator.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:
"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director - Ethics, telephone 06 3569099 ext 85271, email humanethics@massey.ac.nz."

Please note, if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to complete the application form again, answering "yes" to the publication question to provide more information for one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

Research Ethics Office, Research and Enterprise
Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand **T** 06 350 5573; 06 350 5575 **F** 06 355 7973
E humanethics@massey.ac.nz **W** http://humanethics.massey.ac.nz

Human Ethics Low Risk notification

Professor Craig Johnson
Chair. Human Ethics Chairs' Committee and Director (Research Ethics)

Appendix B. Methodology sub-sections

1. Introduction

This section explains the research methodology applied in this study. It begins with a discussion of research philosophy centred on the assumptions of ontology and epistemology. It is followed by a discussion of the research approach and an appraisal of alternative methodologies. Finally, the validity and reliability of the research are discussed.

2. Research philosophy (ontology and epistemology)

Research methodology is a systematic way of solving the research problem (Kothari, 2004). A solid understanding of the research philosophy has a great influence on the research methodology applied by the researcher. In the context of social research, ontology and epistemology are the central perspectives (Grix, 2002). Researchers will strongly build their belief and logic of arguments based on the ontological and epistemological perspective when deciding which way to see a problem, selecting, and applying the research method.

The ontological perspective is concerned with what we can know from reality. This perspective includes objectivism and a constructivist approach (Bryman & Bell, 2011), which represent an opposing viewpoint as shown in the Table B1. Objectivism views the social actors as an external part of social reality, whereas, constructionism sees them as the producer of social phenomena (Grix, 2002). On this basis, the objectivism approach is assumed to ignore the human contribution to forming culture or system through ideas and interaction, instead focusing on the tangible object, existing rules or procedures and beliefs. Constructionism, on the other hand, has emphasised the importance of the human role in changing the culture or system in which people live. For instance, each region may have its own rules, regulations and systems which differentiate its culture from that of other regions, due to the idea development of social actors.

Table B1. Difference between objectivism and constructionism

Elements	Objectivism	Constructionism
Nature of an organization	Tangible object, external to the employees	The social construct that arises from the interaction of individuals
Organization drivers	Set rules, procedures, mission, statement, processes and structures	Evolving negotiated order, rules and procedures act as principles leading to a community practice
Organisational culture	Shared beliefs and values of employees who have internalize commonplace social norms	An emergent reality that is constantly being constructed and reconstructed through the interactions of the employees

Source: Bryman & Bell (2011)

The epistemology perspective is concerned with "what and how we can know" from reality. This perspective comprises the positivism and interpretivism approaches, which are also considered contrasting with each other, as presented in Table B2. Positivism encourages an application method that is similar to those used in natural sciences by viewing social reality, whereas, interpretivism advocates a strategy that observes differences between objects and peoples (Bryman & Bell, 2011). The distinctions between positivism and interpretivism have led to the relation of the research and theory into a deductive and inductive perspective. Positivism is a deductive base approach in which the theory guides research and tends to generalize problems through hypothesis, meanwhile, interpretivism is a broad perspective based on subjects that lead to theory and inductive learning (Bryman & Bell, 2011). Positivism tends to use codes, measurement, and observation in data collection. Meanwhile, interpretivism promotes causal explanation through meaningful interpretation for gaining better understanding of social reality.

Table B2. Difference between positivism and interpretivism

Element	Positivism	Interpretivism
Basis	Natural Sciences	Human interactions
Approach to Social Science	Explanation and generalization of human behaviour	Causal explanation and interpretive understanding of human behaviour
Subject matter	Nature	Social reality
The subject actions	Inanimate and unmotivated	Meaningful and engaged
Data collection	Observation, codification and measurement	Comprehend the perspective of the human subjects
Research & Theory	Mostly deductive	Strong inductive learning

Source: Bryman & Bell (2011)

3. Appraisal of alternative research methodologies

Ontology and epistemology have had a strong connection in relation to the decision of a quantitative or a qualitative methodology, as presented in Table B3. A quantitative approach is used to test the theory, meanwhile, a qualitative method is to build a theory (Bryman & Bell, 2011). In doing so, the quantitative method occupies objectivism, positivism, and deductive approaches; whereas, the qualitative method engages with constructionism, interpretivism and inductive approaches (Grix, 2002).

Table B3. Main differences between quantitative and qualitative

Elements	Quantitative	Qualitative
Principal orientation to the theory	Deductive, testing of theory	Inductive, generation of theory
Epistemological orientation	Natural science model in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructionism

Source: Bryman A & Bell (2011)

Despite the contrasting view, each perspective has its weaknesses and strengths. A quantitative method has a strong approach by providing numeric data for scientific reasoning. However, the quantitative method is often seen as a straitjacket method (Bryman, 2012b). The hypothesis use in this method may limit the viewpoints. Other possible influencing variables are often overlooked once the hypothesis has been established. Meanwhile, a qualitative method has a powerful interpretation to understand social behaviour. On the other hand, it is considered as subjective, difficult to replicate, has a generalization problem, and a lack of transparency (Bryman, 2012b). As there is no similar situation in each case, the main generalization for duplication is offered through the basic concept of research, in which modifying and adjusting the context is needed.

The above discussion has led to a conclusion that no single method is perfect. Bryman & Bell (2011) said that there is no pure deductive or inductive. There might be something that can be seen quantitatively and, at the same time, require qualitative judgement. Bryman A & Bell (2011) further revealed that quantitative and qualitative approaches could be complementary methods to view things from a unified approach. Hence, mixing these methods is further proposed as a single research method called ‘a mixed-method’ (Bryman & Bell, 2011; Claydon, 2019; Cresswell, 2014). Mix-method can be conducted whether qualitative can support the quantitative approach or the other

way round. The following Table B4 summarizes important elements in each method to better explain the differences.

Table B4. Alternative research design

Quantitative	Qualitative	Mixed Methos
- Experimental designs - Nonexperimental designs (i.e., survey)	- Narrative - Phenomenology - Grounded Theory - Ethnographies - Case Study	- Convergent - Explanatory sequential - Exploratory sequential - Transformative, embedded or multiphase

Source: Cresswell (2014)

4. Selection of research methodologies

This study explored a sustainable agrifood value chain transformation in developing countries to look closely at the complex dynamics in the mechanism of transformation. Transformation topic requires exploration from a comprehensive viewpoint. According to Cresswell (2014), for the transformative problem, a mixed method is suitable. Bryman and Bell (2011) add that a mixed method could be used in the situation where a researcher cannot rely on a single method or the needs of both for static and processual methods such as qualitative research facilitates quantitative research or the way round. It means that different methods can be applied in order to achieve different purposes in a study (Saunders et al., 2009). A mixed method also allows richer data generation and enables gaining responses through different methods (Claydon, 2019). Dubey et al., (2015) further states that the mixed-method research is also needed in the field of sustainable chain management in order to provide a thorough knowledge of the linkages between the hierarchical relationships among constructs. It is because a sustainability approach could be examined at different scales of value chain, such as individual (farm), local, global (sector-specific) and plot (Diazabakana et al., 2014). Therefore, the combination of quantitative and qualitative will develop a stronger understanding of the research problem and overcome the limitations (Cresswell, 2014).

5. Research approach

5.1 Research Process Overview

This study has used a systematic process with six key procedures, as shown in Figure B1. Cooper & Schindler, (2008) define the research process as activity planning-based that occupy the research question, selection of sources (within types of information) for specifying variables

relationship and outlining the procedures. However, the Covid pandemic outbreak has required considerable flexibility in operations in order to adjust to circumstances, overcome obstacles, and seize opportunities.

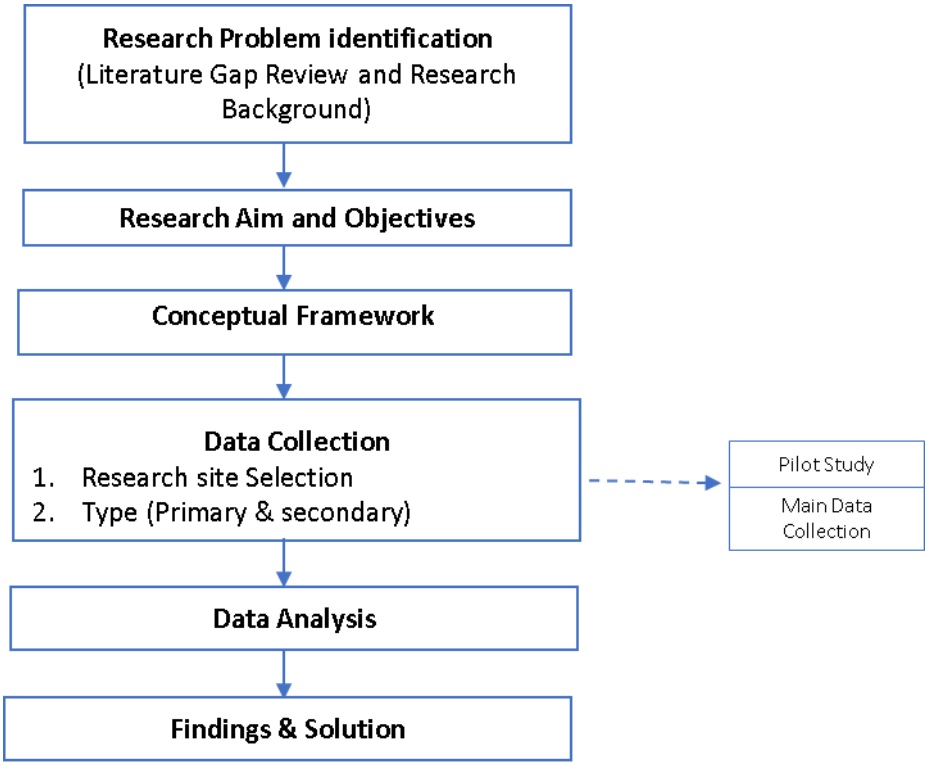


Figure B1. Research process

a. Problem identification

The research procedure begins with identifying a problem to determine the research gap. A literature review (in the topic of agrifood value chain and sustainability) and a research background examination (developing countries context) were conducted to accomplish this step. Research gaps led to the identification of crucial questions and recognition of the need for deeper investigation.

b. Research aim and objectives

The aim and objectives of the study were created and prioritised depending on the flow and logic of investigation found in the research gap. The study aims to enable a sustainable agrifood value chain transformation in developing countries. To achieve this, the study focuses on four essential objectives.

1. To develop a theoretical framework to enable a sustainable agrifood value chain transformation in developing countries;

2. to assess and evaluate agrifood value chain practice in developing countries;
3. to identify and analyse the enabling factors for a sustainable agrifood value chain transformation in developing countries; and
4. to assess smallholders' heterogeneity towards sustainable agrifood value chain in developing countries.

c. Conceptual framework

A comprehensive literature review was conducted using previous literature to build a conceptual framework. The review primarily focuses on two key approaches: agrifood value chain transformation and sustainability. The literature review specifically highlights the urgency of assisting the transformational practices in the context of developing countries. In this regard, the study gives particular focus on examining how to bridge the gap and examine possibilities for the advancement mechanism of sustainable agrifood value chains' transformation framework. The integration of three key dimensions—sustainability, governance, and value addition—is the central focus of the study (a detailed framework is presented in Chapter 2). Based on this framework, the instruments for the research were further developed.

d. Data Collection

This research addresses the cashew sector in Indonesia. The cashew sector in Indonesia has the potential to transform the value chain and is ideal for this research setting. In the future, the cashew industry will unavoidably need to evolve sustainably in order to be viable over the long term due to increased global trade. In addition, cashews are a tropical crop, rarely grown in many western countries. The supply of cashews on the world market is reliant on developing countries, like Indonesia. Indonesia is a developing country with a cashew product comprising 99.8% smallholders, with the majority of the product (over 70%) going to the global market. Sumenep regency of Madura Island was selected as the survey area among Indonesia's producer regions. The "Cashew Belt" programme was applied in this significant producer area in 2014, where about 2,660 hectares were intensified. The island is also close to an export-import site and has a high productivity rate of about 0.76 kg/ha.

This study relies on primary data, supplemented by secondary data. Primary data has advantages in terms of consistency with research questions and objectives and is appropriate for gaining an understanding of people's opinions regarding the reasons for their behaviour. Secondary

data aids in the discovery of information to solve problems, providing a better understanding of problems, and the ability to explain the research problem (Ghauri et al., 2020). The Table below describes the data types being collected in this study.

Table B5. Data collection process

Type of data	Data	Method	Source
Primary Data	Description, responses, & relevant information	Semi-structured and face-to-face interview, photograph, recording, observation	1. Value chain actors 2. Elite experts from related institution and/or governmental office
Secondary Data	Governmental report, regulation, statistical data, & relevant information	Browsing from relevant sources, document collection from relevant governmental institution	1. Previous researchs (book, journals, research report) 2. Government documents sources from national and local range (i.e. Agricultural and Plantation Agency, Statistic Board)

Primary data was collected in two stages.

Pilot study data collection. The pilot study provides preliminary findings to understand and improve the concept before the comprehensive data collection. The pilot study used a qualitative approach which is capable of generating and testing theory throughout the process, and which spurs further data collection (Bryman, 2012a). In the pilot study, the value chain mapping was applied for identifying and evaluating the general structure of governance, value addition, business culture and stakeholders in the study area. A combination of purposive and snowball method sampling was used. The purposive method helped to select the initial stage respondents in the value chain, with a stress on farmers with at least two years of cashew nut harvesting expertise. The next stage respondents (intermediaries, processors, and exporters) relied heavily on snowball information. Besides value chain players, stakeholders' interviews were done purposively from the elite/expert that involves relevant governmental officers (i.e., Plantation Agency, Cooperative and Small Medium Enterprise Agency, Extension Worker, and Industrial and Trade Agency). Within stakeholders' interviews, the possible secondary data were gathered. A semi-structured and face-to-face interview, photograph, and recording were used in the overall interview process.

Main data collection. The main data collection was designed purposively using a quantitative approach. A total of 159 smallholders as respondents were collected. The respondents' criteria were those who had at least ten trees and two years' harvesting experience. A semi-structured, face-to-

face interview, photograph, and recording were used in the data collection, using a strict pandemic protocol.

e. Analysis approach

This study used a sequential process of analysis based on the conceptual framework. A qualitative analysis was first used, followed by a quantitative method. Data from a pilot study were used for the qualitative analysis. The qualitative analysis could carry in-depth information with limited source respondent. The quantitative analysis employed a statistical process. The data for the analysis was taken from the main data collection. Principal component analysis, Cluster analysis, Cross-tab analysis, and One-Way ANOVA were the statistical analysis employed in this study, using SPSS. The specifics of analysis use are covered in Chapters 3-5.

f. Findings and conclusion

The last step is to outline findings and draw the conclusion. Limitations are addressed, research implication is highlighted, and future research is discussed.

5.2 Ethical consideration

As the present study involves people, it is necessary to address ethical considerations. The research ethic is important to ensure that no one will suffer from the consequences of research activities (Cooper & Schindler, 2008). The ethical consideration will be based on the formal procedures of the Massey University Code of "Ethical Conduct for Research, Teaching and Evaluations Involving Human Participants" that occupy principles of Autonomy, Avoidance of Harm, Benefit, Justice and Relationship (Code of Ethical Conduct for Research, Teaching and Evaluations Involving Human Participants, 2017). The ethics notification for this research has been assessed as Low Risk (Ethics Notification – 4000022019) released on 02 December 2019. Owing to pandemic situation, the research ethics were re-evaluated and agreed to be continued under strict guidelines in accordance with the requirements in place. The face-to face interview method was modified and Kobo toolbox platform was utilised to facilitate data collection.

6. Research validity and reliability

The quality of research findings has a strong relationship with the validity and reliability. Reliability and validity are relevant to the measurement to establish believability and the credibility of findings (Neuman, 2014). In general, validity is the truthful of findings and reliability is

interpreted as consistency of measures. The validity and reliability of the approach applied in this study (quantitative and qualitative) is critically reviewed to find the clarity on the implementation.

In order to guarantee the quality of the research findings, a comprehensive review of literature relevant to sustainable agrifood value chain transformation was first conducted, drawn mainly from the context of developing countries. The review contributed to the development of a coherent conceptual framework for comprehending the crucial aspects required in this study. According to Neuman (2014), how well the concept and operational definition will fit with each other can be addressed through content, criterion, and construct validity.

The next step involved carefully developing measurement instruments, which were further developed into questionnaires both qualitatively and quantitatively. Hurmerinta-Peltomäki & Nummela (2006) state that using a combination of qualitative and quantitative helps to improve the research validity and reliability. The qualitative method was first used to aid in mapping the current state of value chain practice, which was applied at the pilot study stage. This method was also used concurrently to define and clarify some measurement instruments which would be required for the main data collection stage. Face-to-face interviews with key respondents (value chain players and stakeholders) were conducted to allow the researcher to provide clear explanations and avoid misunderstandings. To provide more reliable data, the interview record, document analysis, and photographs were gathered. Neuman (2014) advises that the validity judgement in the qualitative approach uses truthfulness as the core principle of validity, while a variety of techniques are employed to determine reliability to ensure consistent observation (i.e., interviews, videos, photographs, and document studies).

In order to follow up the findings from the qualitative approach, the quantitative approach was employed to help assess the enabling factors and the enabling actors of sustainable value chain transformation. A quantitative analysis has a distinct reliability and validity to measure criteria by using indicators (David & Sutton, 2011). Therefore, the assessment involved measurement scales and were statistically analysed. Improving the reliability in quantitative analysis can be accomplished, not only through a clear theoretical construction, but also through precise measurement level, multiple indicators, and a pilot study (Neuman, 2014).

Overall, the qualitative and quantitative method used in this study can serve the validity and reliability of findings as a basis for answering each question. Utilising both qualitative and quantitative approaches in this study complements the tailoring of the "perfect jacket," which is neither a straight nor a loose-fitting jacket as mentioned in the literature. The goal of the study was accomplished, as anticipated, leading to a better understanding of the subject matter.

References of Appendix B

Bryman, A. (2012a). *Social research methods* (4th ed). Oxford University Press. https://dl1.cuni.cz › mod_folder › content › Bryman

Bryman, A. (2012b). The Nature of Qualitative Research. In *Social Research Methods* (4th Editio, pp. 379–414). Oxford University Press.

Bryman, A., & Bell, E. (2011). Chapter 1-Business Research Strategies. In *Business Rersearch Methods:* (3rd Editio, pp. 3–38). Oxford University Press.

Claydon, J. (2019). Using Mixed Method Approach for Corporate Social Responsibility Research. In *Handbook of Research Methods in Corporate Social Responsibility*. Edward Elgar.

Cooper, D. R., & Schindler, P. S. (2008). Ethics in Business Research. In *Business Research Methods:* (pp. 118–141). McGraw Hill.

Cresswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed). SAGE Publications, Inc.

David, M., & Sutton, C. D. (2011). Survey Design. In *Social Research: An Introduction 2nd Edition* (pp. 239–270). Sage Publications.

Diazabakana, A., Latruffe, L., Bockstaller, C., Finn, J., Kelly, E., Ryan, M., & Uthes, S. (2014). *A review of Farm Level Indicators of Sustainability with a Focus on CAP and FADN* (p. 101).

Dubey, R., Gunasekaran, A., Papadopoulos, T., & Childe, S. J. (2015). Green Supply Chain Management Enablers: Mixed methods research. *Sustainable Production and Consumption*, *4*, 72–88. https://doi.org/10.1016/j.spc.2015.07.001

Ghauri, P., Grønhaug, K., & Strange, R. (2020). *Research Methods in Business Studies*. Cambridge University Press.

Grix, J. (2002). Introducing Students to the Generic Terminology of Social Research. *POLITIC*, *22*(3), 175–186.

Hurmerinta-Peltomäki, L., & Nummela, N. (2006). Mixed methods in international business research: A value-added perspective. *Management International Review*, *46*(4), 439–459. https://doi.org/10.1007/s11575-006-0100-z

Kothari, C. R. (2004). *Research Methodology: Methods & Techniques*. New Age International (P) Ltd., Publishers. https://dinus.ac.id/repository/docs/ajar/Kothari_-_Research_Methodology_Methods_and_Techniques_-_2004.pdf

Code of Ethical Conduct for Research, Teaching and Evaluations Involving Human Participants, 18 (2017).

Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson Education Limited.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed). Prentice Hall.

Appendix C. Supplementary materials of Chapter 4

Appendix C1. Elements of sustainable cashew value chain transformation

Table C1. 1. Elements of sustainable cashew value chain transformation

Activities	Key Elements
1. Production	1) Rejuvenation by using Government grant seeds (P_1) 2) Rejuvenation by using own seeds (P_2) 3) Manual weeding (P_3) 4) Herbicide application (P_4) (-) 5) Manure application (P_5) 6) Chemical fertilizer application (P_6) (-) 7) Smoking the cashew farm for pest-disease control (P_7) 8) Pesticide application(P_8) (-) 9) Regular Pruning after harvesting (P_9) 10) The ripe nuts harvesting (P_{10}) 11) Ripe cashew apples use as income alternative (P_{11}) 12) Cone harvesting method application (P_{12}) 13) Modern tools for cashew cultivation (P_{13}) 14) Modern tools for cashew harvesting (P_{14}) 15) The hedgerow agreement (P_{15}) 16) A better payment to employees (P_{16}) 17) A better payment for family labour (P_{17}) 18) Non-family members employment (P_{18})
2. Marketing	1) Cashew nuts grading (M_1) 2) Cashew nut drying (M_2) 3) Cashew nuts unshelling (M_3) 4) Ready-to-eat product processing (M_4) 5) Farmgate/home transaction (M_5) (-) 6) Market/buyer's place transaction (M_6) 7) New buyers' finding (M_7) 8) A broader information finding (M_8) 9) Digital tool use in information-communication (M_9) 10) Cashew nut price negotiation (M_{10}) 11) A fixed-price contract consideration (M_{11}) 12) A broader information sharing (M_{12}) 13) Neighbourhood helping in marketing activities (M_{13}) 14) Charity allocation (M_{14}) 15) Loan for neighbours (M_{15}) 16) Children's/family education improvements (M_{16}) 17) Family lifestyle improvements (M_{17})
3. Certification and Coordination (with other farmers & Stakeholders)	1) Certification information support (C_1) 2) Certification training support (C_2) 3) Certification financial support (C_3) 4) Easy and simple procedure certification support (C_4) 5) Maintain/join farmer group membership (CF) 6) Training support in cashew production (CS_1) 7) Training support in cashew processing (CS_2) 8) Training support in cashew marketing (CS_3) 9) Input subsidy support (CS_5) 10) Processing tool subsidy support (CS_6) 11) Loan/credit with low interest support (CS_7) 12) Financial support (CS_8) 13) New buyers' connection support (CS_9) 14) Sharing with expert support (CS_{10}) 15) Extension officers/Government support (CS_{12}) 16) NGO/Non-Government Organisation support (CS_{13})

Note: P = Production, M = Marketing, C = Certification, CF= Coordination with Other Farmers, CS= Coordination with Stakeholders, (-) = negative statement for transformation

Appendix C2. Distribution frequency

Table C2. 1. Smallholder's characteristic

Variables	Categories	Frequency	Percentage
Age	17-35 years	36	22.6%
	>35-60 years	87	*54.7%
	Over 60 years	36	22.6%
	Total	**159**	**100%**
Gender	Male	60	37.7%
	Female	99	*62.3%
	Total	**159**	**100%**
Education	No education/Not finished primary school	65	*40.9%
	Primary School	62	39%
	Junior High School	13	8.2%
	Senior High School	14	8.8%
	Tertiary	5	3.1%
	Total	**159**	**100%**
Experience	± 2-5 years	13	8.1%
	>5-10 years	16	10.1%
	Over 10 years	130	*81.8%
	Total	**159**	**100%**
Cashew Farm Arrangement	Single cashew farm (Single crop)	58	36.5%
	Mixed farming (hedgerow arrangement)	101	*63.5%
	Total	**159**	**100%**
Cashew Trees Type Arrangement	Inherited Cashew Trees	101	*63.5%
	Self-Cultivation Cashew Trees	42	26.4%
	Combination (Including government grant tree)	16	10.1%
	Total	**159**	**100%**

Table C2. 2. Distribution frequency of production and marketing

Variables	Application	Frequency	Percentage
Rejuvenation	No	103	*64.8%
	Yes	56	35.2%
	Total	**159**	**100%**
Weeding	No	34	21.4%
	Yes	125	*78.6%
	Total	159	**100%**
Fertilizing	No	75	47.2%
	Yes	84	*52.8%
	Total	159	**100%**
Pest and Disease Control	No	129	*81.1%
	Yes	30	18.9%
	Total	**159**	**100%**
Pruning	No	44	27.7%
	Yes	115	*72,3%
	Total	**159**	**100%**
Harvesting	No	NA	NA
	Yes	159	*100%
	Total	**159**	**100%**
Hedgerow Agreement	No	91	*57.2%
	Yes	68	42.8%
	Total	**159**	**100%**
Self- Employment	No	10	6.3%
	Yes	149	*93.7%
	Total	**159**	**100%**
Main Family Employment	No	30	18.9%
	Yes	129	*81.1%
	Total	**159**	**100%**
Non-Family Employment	No	122	*76.7%
	Yes	37	23.3%
	Total	**159**	**100%**

Table C2. 3. Distribution frequency of marketing

Variables	Elements	Frequency	Percentage
Cashew Marketing Products	Dry in shelled nuts	107	*67.3%
	Wet in shelled nuts	50	31.4%
	Combination (Wet in shelled nuts & Dry in shelled nuts)	2	1.3%
	Total	**159**	**100%**
Grading	No Grading	125	*78.6%
	Grading	34	21.4%
	Total	**159**	**100%**
Buyers			
a) Wet in Shell nuts	Small-scale Intermediaries	40	*76.9%
	Cashew Centre/main wholesaler	1	1.9%
	Other Wholesalers	10	19.2%
	Combination	1	1.9%
	Total	**52**	**100%**
b) Dry in Shell nuts	Small-scale Intermediaries	72	*66.1%
	Cashew Centre/main wholesaler	7	6.4%
	Other Wholesalers	24	22.0%
	Combination	6	5.5%
	Total	**109**	**100%**
New/Different Buyers	Same buyer	69	43.4%
	Different buyer	86	*54.1%
	Combination	4	2.5%
	Total	**159**	**100%**
Transaction Site	Farmgate/home	36	22.6%
	Marketplace/Buyers' site	123	*77.4%
	Total	**159**	**100%**
Transportation	bicycle	15	9.4%
	motorbike	139	*87.4%
	pick-up vehicle/car	4	2.5%
	combination	1	0.6%
	Total	**159**	**100%**
Information Searching	No-Searching	50	31.4%
	Searching Information	109	*68.6%
	Total	**159**	**100%**
Information Sharing	No Sharing	42	26.4%
	Sharing with neighbourhood farmers	114	*71.7%
	Others	3	1.9%
	Total	**159**	**100%**
Price Setting	Accept cashew nut price set by the buyers	137	*86.2%
	Negotiate with the buyers	22	13.8%
	Total	**159**	**100%**
Helping Neighbourhood in Marketing	No helping activities	77	48.4%
	Mutual help with neighbourhood farmers (i.e. to pack, carry, etc.)	82	*51.6%
	Total	**159**	**100%**
Charity Allocation (from Cashew Marketing Income)	No allocation	5	3.1%
	Yes, by 'Shodaqoh' (charity) at mosque/poor neighbourhood	154	*96.9%
	Total	**159**	**100%**
Cashew Marketing Income on Family Fulfilment	Not adequate	71	44.7%
	Adequate	88	*55.3%
	Total	**159**	**100%**

Table C2. 4. Certification and coordination (With other farmers and stakeholders)

Variables	Elements	Frequency	Percentage
Certification Status	No	159	*100%
	Yes	0	0%
	Total	**159**	**100%**
Non-Certified Reason Status	Lack of information (don't know)	126	*79.2%
	Complicated procedures	2	1.3%
	Not beneficial	23	14.5%
	Other Reasons	1	0.6%
	Combination	7	4.4%
	Total	**159**	**100%**
Farmer Group Membership	No	108	*67.9%
	Yes	51	32.1%
	Total	**159**	**100%**
1. Training			
a. Training Participation	No	155	*97.5%
	Yes	4	2.5%
	Total	**159**	**100%**
b. Non-Training	Lack of information (don't know)	99	*63.9%
	Not beneficial for you	1	.6%
	Busy	44	28.4%
	Combination	11	7.1%
	Total	**155**	**100%**
2. Supporting Program			
Supporting Program	No	155	*97.5%
	yes	4	2.5%
	Total	**159**	**100%**

Appendix C3. Respondents' intention towards sustainable value chain practice

Table C3. 1. Respondents' intention towards sustainable value chain practice

Activities	Key Elements	Mean	Standard Deviation (SD)
1. Production	1) Rejuvenation by using Government grant seeds (P_1)	3.45	1.168
	2) Rejuvenation by using own seeds (P_2)	3.31	1.454
	3) Manual weeding (P_3)	4.12	.874
	4) Herbicide application (P_4) (-)	*2.58	1.365
	5) Manure application (P_5)	3.82	1.262
	6) Chemical fertilizer application (P_6) (-)	3.28	1.383
	7) Smoking the cashew farm for pest-disease control (P_7)	3.13	1.278
	8) Pesticide application(P_8) (-)	*2.80	1.321
	9) Regular pruning after harvesting (P_9)	3.65	1.115
	10) The ripe nuts harvesting (P_{10})	3.41	1.208
	11) Ripe cashew apples use as alternative income (P_{11})	3.61	1.125
	12) Cone harvesting method application (P_{12})	3.35	1.263
	13) Modern tools investment for cashew cultivation	*2.84	1.302
	14) Modern tools investment for cashew harvesting (P_{14})	*2.82	1.305
	15) The hedgerow agreement with neighbourhood farms (P_{15})	3.35	1.676
	16) A better payment to employees (P_{16})	*1.93	1.410
	17) A better payment for family labour (P_{17})	*1.82	1.237
	18) Non-family members employment (P_{18})	*2.06	1.485
2. Marketing	1) Cashew nuts grading (M_1)	3.05	.947
	2) Cashew nut drying (M_2)	4.03	.856
	3) Cashew nuts unshelling (M_3)	*2.40	.780
	4) Ready-to-eat product processing (M_4)	*2.38	.761
	5) Farmgate/home spot transaction (M_5) (-)	3.36	.963
	6) Market/buyer's spot transaction (M_6)	3.81	.851
	7) New buyers' finding (M_7)	3.86	.875
	8) A broader information searching (M_8)	3.78	.946
	9) Digital tool use in information-communication (M_9)	3.75	1.077
	10) Cashew nut price negotiation (M_{10})	2.97	.889
	11) A fixed-price contract consideration (M_{11})	2.03	.750
	12) A broader information sharing (M_{12})	3.91	.889
	13) Neighbourhood helping in marketing activities (M_{13})	3.47	1.054
	14) Charity allocation from income contribution (M_{14})	4.33	.570
	15) Loan for neighbours (M_{15})	3.75	.907
	16) Better children's/family education (M_{16})	4.48	.514
	17) Better family lifestyle (M_{17})	3.91	.990
3. Certification and Coordination (with Farmers & Stakeholders)	1) Support of certification information (C_1)	3.44	.883
	2) Support of certification training (C_2)	3.33	1.028
	3) Support of certification financial (C_3)	4.01	.861
	4) Support of simple procedure certification (C_4)	3.68	.963
	5) Maintain/join membership of farmer group (CF)	3.20	.933
	6) Training support in cashew production (CS_1)	3.55	.919
	7) Training support in cashew processing (CS_2)	3.50	.913
	8) Training support in cashew marketing (CS_3)	3.58	.910
	9) Input subsidy support (CS_5)	4.11	.656
	10) Processing tool subsidy support (CS_6)	3.96	.754
	11) Loan/credit with low interest support (CS_7)	*2.25	.954
	12) Financial support (CS_8)	4.48	.501
	13) New buyers' connection support (CS_9)	3.94	.836
	14) Expert support (CS_{10})	3.69	1.007
	15) Extension officers/Government support (CS_{12})	4.31	.492
	16) NGO/Non-Government Organisation support (CS_{13})	3.99	.784

Note: P = Production, M = Marketing, C = Certification, CF= Coordination with Other Farmers, CS=Coordination with Stakeholders
(-) = negative statement for transformation, * = lack of orientation towards practise transformation

Appendix C4. PCA analysis result

Table C4. 1. PCA analysis result

Element	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Manure application (P_5)	.766							
Loan for neighbours (M_{15})	.735							
Pesticide application(P_8) (-)	.731							
Chemical fertilizer application (P_6) (-)	.699							
Family lifestyle improvements (M_{17})	.682							
Neighbourhood helping in marketing activities (M_{13})	.658							
Herbicide application (P_4)	.633							
Digital tool use in information-communication (M_9)	.605							
Modern tools for cashew harvesting (P_{14})	.591							
Modern tools for cashew cultivation (P_{13})	.584							
Financial support (CS_8)	.507							
Rejuvenation by using own seeds (P_2)	.483							
A better payment to employees (P_{16})	.463							
Non-family members employment (P_{18})	.463							
Training support in cashew marketing (CS_3)		.847						
Training support in cashew processing (CS_2)		.845						
Training support in cashew production (CS_1)		.843						
Processing tool subsidy support (CS_6)		.647						
Input subsidy support (CS_5)		.647						
Maintain/join farmer group membership (CF)		.613						
Certification training support (C_2)		.600						
Sharing with expert support (CS_{10})		.492						
Easy and simple procedure certification support (C_4)			.778					
Certification information support (C_1)			.755					
Certification financial support (C_3)			.717					
Charity allocation (M_{14})			.460					
New buyers' finding (M_7)				.755				
New buyers' connection support (CS_9)				.614				
The ripe nuts harvesting (P_{10})					-.644			
Cone harvesting method application (P_{12})					-.636			
Regular pruning after harvesting (P_9)					.534			
The hedgerow agreement (P_{15})					.480			
A broader information sharing (M_{12})						.708		
A broader information searching (M_8)						.601		
Manual weeding (P_3)						.509		
Cashew nuts grading (M_1)							.747	
A fixed-price contract consideration (M_{11})							.636	
Cashew nut price negotiation (M_{10})							.554	
Cashew nuts unshelling (M_3)								.892
Ready-to-eat product processing (M_4)								.843
Sum of squared (Eigen Value)	**7.285**	**5.972**	**3.686**	**2.743**	**2.539**	**2.414**	**2.250**	**2.176**
Sum of squared (% of Variance)	**14.284**	**11.709**	**7.228**	**5.379**	**4.978**	**4.734**	**4.411**	**4.267**
Cronbach Alpha					**.919**			
KMO					**.840**			
Bartlett's Test					**.000**			

Note: P = Production, M = Marketing, C = Certification, CF= Coordination with Other Farmers, CS= Coordination with Stakeholders, (-) = negative statement for transformation

Appendix C5. Analysis of average means on each component

Table C5. 1. Analysis of average means on each component

PC	Element	Factor Loadings	% Factor Loading	Means	% Factor Loading x Means
PC1	Manure application (P_5)	0.766	8.91%	3.82	0.34
	Loan for neighbours (M_{15})	0.735	8.55%	3.75	0.32
	Pesticide application(P_8) (-)	0.731	8.50%	3.2	0.27
	Chemical fertilizer application (P_6) (-)	0.699	8.13%	2.72	0.23
	Family lifestyle improvements (M_{17})	0.682	7.93%	3.91	0.31
	Neighbourhood helping in marketing activities (M_{13})	0.658	7.65%	3.47	0.27
	Herbicide application (P4)	0.633	7.36%	3.42	0.25
	Digital tool use in information-communication (M_9)	0.605	7.03%	3.75	0.26
	Modern tools for cashew harvesting (P_{14})	0.591	6.87%	2.82	0.19
	Modern tools for cashew cultivation (P_{13})	0.584	6.79%	2.84	0.19
	Financial support (CS_8)	0.507	5.90%	4.48	0.26
	Rejuvenation by using own seeds (P_2)	0.483	5.62%	3.31	0.19
	A better payment to employees (P_{16})	0.463	5.38%	1.93	0.10
	Non-family members employment (P_{18})	0.463	5.38%	2.06	0.11
	Sum	**8.60**	**100%**		**3.30**
PC2	Training support in cashew marketing (CS_3)	0.847	15%	3.58	0.55
	Training support in cashew processing (CS_2)	0.845	15%	3.5	0.53
	Training support in cashew production (CS_1)	0.843	15%	3.55	0.54
	Processing tool subsidy support (CS_6)	0.647	12%	3.96	0.46
	Input subsidy support (CS_5)	0.647	12%	4.11	0.48
	Maintain/join farmer group membership (CF)	0.613	11%	3.2	0.35
	Certification training support (C_2)	0.6	11%	3.3	0.36
	Sharing with expert support (CS_{10})	0.492	9%	3.69	0.33
	Sum	**5.53**	**100%**		**3.61**
PC3	Easy and simple procedure certification support (C_4)	0.778	29%	3.68	1.06
	Certification information support (C_1)	0.755	28%	3.44	0.96
	Certification financial support (C_3)	0.717	26%	4.01	1.06
	Charity allocation (M_{14})	0.46	17%	4.33	0.73
	Sum	**2.71**	**100%**		**3.81**
PC4	New buyers' finding (M_7)	0.755	55%	3.86	2.13
	New buyers' connection support (CS_9)	0.614	45%	3.94	1.77
	Sum	**1.369**	**100%**		**3.90**
PC5	The ripe nuts harvesting (P_{10})	-0.644	28%	2.59	0.73
	Cone harvesting method application (P_{12})	-0.636	28%	2.75	0.76
	Regular pruning after harvesting (P_9)	0.534	23%	3.65	0.85
	The hedgerow agreement (P_{15})	0.48	21%	3.35	0.70
	Sum	**2.294**	**100%**		**3.04**
PC6	A broader information sharing (M_{12})	0.708	39%	3.91	1.52
	A broader information searching (M_8)	0.601	33%	3.78	1.25
	Manual weeding (P_3)	0.509	28%	4.12	1.15
	Sum	**1.818**	**100%**		**3.93**
PC7	Cashew nuts grading (M_1)	0.747	39%	3.05	1.18
	A fixed-price contract consideration (M_{11})	0.636	33%	2.03	0.67
	Cashew nut price negotiation (M_{10})	0.554	29%	2.97	0.85
	Sum	**1.937**	**100%**		**2.69**
PC8	Cashew nuts unshelling (M_3)	0.892	51%	2.4	1.23
	Ready-to-eat product processing (M_4)	0.843	49%	2.38	1.16
	Sum	**1.735**	**100%**		**2.39**

Note: Reverse scoring for negatives statements (-) was applied for the summated scale calculation

Appendix D. Supplementary materials of Chapter *5*

Appendix D1. Descriptive statistics of respondents in the study area

Table D1. 1. General socio-economic characteristics

Variables	Categories	Frequency	%
Demography			
Age	17-35 years	36	22.6%
	>35-60 years	87	54.7%
	Over 60 years	36	22.6%
	Total	**159**	**100%**
Gender	Male	60	37.7%
	Female	99	62.3%
	Total	**159**	**100%**
Education	Less than/around 6 years education (primary school)	127	79.9%
	Junior high school	13	8.2%
	Senior high school	14	8.8%
	Tertiary	5	3.1%
	Total	**159**	**100%**
Experience	± 2-5 years	13	8.2%
	>5-10 years	16	10.1%
	Over 10 years	130	81.8%
	Total	**159**	**100%**
Farmer group membership	Member	51	32%
	Non-member	108	68%
	Total	**159**	**100%**
Farm characteristic			
Cashew farm arrangement	Single cashew farm	58	36.5%
	Mixed farm	101	63.5%
	Total	**159**	**100%**
Cashew trees ownership	Inherited cashew trees	101	63.50%
	Self-Cultivation cashew trees	42	26.4%
	Combination (including government grant trees)	16	10.1%
	Total	**159**	**100%**

Table D1. 2. General farm characteristics

Variable	Mean	Median	Mode	Min	Max	Std
Total farm size (ha)	0.45	0.375	0.25 & 0.375	0.01	2	3503.95
Total cashew tree ownership	32	23	15	10	210	1.13
a. Inherited cashew tree	28	25	15	1	200	22.26
b. Government grant tree	31	2	2	1	100	47.23
c. Self-cultivation tree	30	18	15	5	200	35.00
Total cashew production (kg/year)	540.21	250	200	50	12040	1209.43
Cashew production per tree (kg/tree/year)	14.2	10	10	2.5	72.7	11.86
a. Inherited cashew tree (kg/tree)	13.0	10	10	2.5	80	11.68
b. Government grant tree (kg/tree)	16.4	7.5	0	0	50	21.56
c. Self-cultivation tree (kg/tree)	16.4	11.9	10	0	69.4	12.76
Mixed farming crops (ha)						
a. Corn	0.34	0.25	0.13	0.005	2.00	3378.298
b. Paddy	0.22	0.25	0.25	0.02	0.50	1376.521
c. Other crops	0.27	0.19	0.13	0.005	1.50	2829.506

Table D1. 3. General current practice in production

Variables	Application	Frequency	%
Rejuvenation	No	103	64.8%
	Yes	56	35.2%
	Total	**159**	**100%**
Weeding	No	34	21.4%
	Yes	125	78.6%
	Total	**159**	**100%**
Fertilising	No	75	47.2%
	Yes	84	52.80%
	Total	**159**	**100%**
Pest and disease control	No	129	81.10%
	Yes	30	18.90%
	Total	**159**	**100%**
Pruning	No	44	27.70%
	Yes	115	72.30%
	Total	**159**	**100%**
Harvesting	No	NA	NA
	Yes	159	100%
	Total	**159**	**100%**
Hedgerow Agreement	No	91	57.2%
	Yes	68	42.8%
	Total	**159**	**100%**
Self-employment	No	10	6.3%
	Yes	149	93.7%
	Total	**159**	**100%**
Main family employment	No	30	18.9%
	Yes	129	81.1%
	Total	**159**	**100%**
Non-family employment	No	122	76.70%
	Yes	37	23.30%
	Total	**159**	**100%**

Table D1. 4. General current practice in marketing (a)

Variable	Mean	Median	Mode	Min	Max
Cashew marketing volume (kg)					
a. Wet in shell nut	339.9	200	100	20	3,000
b. Dry in shell nut	571.1	250	180	80	10,435
Cashew marketing price (IDR)					
a. Wet in shell nut	17,317	18,000.00	18,000	10,000	20,000
b. Dry in shell nut	18,023	18,000.00	18,000	14,000	30,000

Table D1. 5. General current practice in marketing (b)

Variables	Elements	Frequency	%
Products	Dry in shelled nut	107	67.3%
	Wet in shelled nut	50	31.4%
	Combination	2	1.3%
	Total	**159**	**100%**
Grading	No-Grading	125	78.6%
	Grading	34	21.4%
	Total	**159**	**100%**
Buyers			
a) Wet in shell nut	Small-scale intermediaries	40	76.9%
	Cashew centre/main wholesaler	1	1.9%
	Other Wholesalers	10	19.2%
	Combination	1	1.9%
	Total	**52**	**100%**
b) Dry in shell nut	Small-scale intermediaries	72	66.1%
	Cashew Centre/main wholesaler	7	6.4%
	Other Wholesalers	24	22%
	Combination	6	5.5%
	Total	**109**	**100%**
Transaction	Same buyer	69	43.4%
	Different buyer	86	54.1%
	Combination	4	2.5%
	Total	**159**	**100%**
Transaction site	Farmgate/home	36	22.6%
	Marketplace/buyers' site	123	77.4%
	Total	**159**	**100%**
Information searching	No-searching	50	31.4%
	Searching information	109	68.6%
	Total	**159**	**100.0%**
Information sharing	No-sharing	42	26.4%
	Sharing with neighbourhood farmers	114	71.7%
	Others	3	1.9%
	Total	**159**	**100%**
Price setting	Price taker	137	86.2%
	Negotiate with the buyers	22	13.8%
	Total	**159**	**100%**
Neighbourhood helping	No helping activities	77	48.4%
	Mutual help (i.e. to pack, carry, etc.)	82	51.6%
	Total	**159**	**100%**

Table D1. 6. General condition of certification and coordination

Variables	Elements	Frequency	%
Certification status	No	159	100%
	Yes	0	0%
	Total	**159**	**100%**
Coordination with other farmers (farmer group)	No	108	67.9%
	Yes	51	32.1%
	Total	**159**	**100%**
Coordination with stakeholder in training & subsidy	No	155	97.50%
	Yes	4	2.50%
	Total	**159**	**100%**

Appendix D2. Smallholders' heterogeneity towards sustainable value chains practice

Table D2. 1. Smallholders' heterogeneity towards sustainable value chains practice

Current Practice	Clusters			
	Accelerators	**Progressors**	**Inattentive**	**Conservative**
1. Farm Practice Milieu				
a. Rejuvenation using owned seeds	4.27	4.24	2.54	2.05
b. Weed manual sickle	4.47	4.16	4.1	3.68
c. Weed herbicide (-)	2.04	2.08	1.95	3.66
d. Manure fertiliser	4.38	3.95	4.21	2.63
e. Chemical fertiliser (-)	1.16	1.38	1.36	3.08
f. Pesticide (-)	1.31	2.03	1.97	3.66
g. Pruning	4.09	3.7	2.85	3.89
h. Modern cultivation tool buying	3.47	2.89	3.38	1.47
i. Modern harvesting tool buying	3.42	2.89	3.38	1.47
j. Non-family employment	3.44	1.92	1.56	1.05
k. Better payment employee	3.31	1.76	1.41	1
l. Hedgerow agreement	4.6	4.27	2.1	2.24
m. Neighbourhood helping	4.04	3.68	3.59	2.47
n. Loan for neighbours	4.13	4.08	3.9	2.82
o. Family lifestyle improvement	4.51	4.35	3.97	2.71
p. Charity allocation	4.76	4.49	4.03	4
Sum	**57.4**	**51.87**	**46.3**	**41.88**
Mean	**3.6**	**3.2**	**2.9**	**2.6**
2. Information-Communication				
a. Information searching	4.29	3.84	3.31	3.61
b. Digital information tool using	4.11	3.81	4.28	2.74
c. Broader information sharing	4.22	4	3.79	3.58
Sum	12.62	11.65	11.38	9.93
Mean	**4.2**	**3.9**	**3.8**	**3.3**
3. Stakeholder Supports				
a. Production training supports	4.29	3.78	3.15	2.84
b. Processing training supports	4.24	3.76	3.08	2.82
c. Marketing training supports	4.31	3.78	3.21	2.89
d. Tool subsidy	4.56	3.78	3.87	3.53
e. Input Subsidy	4.71	4.03	4.05	3.55
f. Farmer group membership	3.64	3.19	3.15	2.74
g. Expert support	4.51	4.03	2.9	3.18
h. Finance support	4.91	4.54	4.38	4
Sum	35.17	30.89	27.79	25.55
Mean	**4.4**	**3.9**	**3.5**	**3.2**
4. Certification Orientation				
a. Certification information availability	3.6	3.7	2.79	3.66
b. Simple procedure in certification	4.47	3.76	2.82	3.55
c. Certification training	4.07	3.76	2.87	2.5
d. Certification financial support	4.76	4	3.15	4
Sum	16.9	15.22	11.63	13.71
Mean	**4.2**	**3.8**	**2.9**	**3.4**
5. Market Expansion				
a. Finding new buyer	4.36	3.89	3.36	3.76
b. Buyers' connection support	4.62	4	3.41	3.63
Sum	8.98	7.89	6.77	7.39
Mean	**4.5**	**3.9**	**3.4**	**3.7**
6. Pre-Harvesting Value				
a. Ripe nuts harvesting	2.62	3.05	4.08	4
b. Cone harvesting method	2.98	2.54	4.36	3.53
Sum	5.6	5.59	8.44	7.53
Mean	**2.8**	**2.8**	**4.2**	**3.8**
7. Value Capturing				
a. Grading	3.02	2.65	3.44	3.08
b. Negotiation	3.24	2.84	2.97	2.76
c. Fixed-price contract	2.04	1.51	2.28	2.26
Sum	8.3	7	8.69	8.1
Mean	**2.8**	**2.3**	**2.9**	**2.7**
8. Post-harvesting Value				
a. Shelled nuts	2.38	2.73	2.36	2.13
b. Ready to eat nut	2.49	2.76	2.26	2.03
Sum	4.87	5.49	4.62	4.16
Mean	**2.4**	**2.7**	**2.3**	**2.1**

Note:
1) 1= strongly no intention, 2= no intention, 3=relatively undecisive, 4=with intention, 5= with strong intention
2) (-) a negative relationship that has been treated with reverse scoring to retain the distribution in summated scale

Appendix D3. Profile of each cluster

Table D3. 1. Socio-economic profile of each cluster

Socio-economic	Clusters				Sig
	Accelerators	Progressors	Inattentive	Conservative	
1. DEMOGRAPHY					
Gender					
Female	66.7%	64.9%	56.4%	60.5%	
Male	33.3%	35.1%	43.6%	39.5%	0.778
Total	**100%**	**100%**	**100%**	**100%**	
Age					
>17-35 years	17.8%	18.9%	25.6%	28.9%	
>35-60 years	66.7%	59.5%	43.6%	47.4%	0.393
Over 60 years	15.6%	21.6%	30.8%	23.7%	
Total	**100%**	**100%**	**100%**	**100%**	
Education					
Less/around than 6 years education	80%	91.9%	71.8%	76.3%	
Junior High School	11.1%	5.4%	5.1%	10.5%	
Senior High School	4.4%	2.7%	15.4%	13.2%	0.028*
Tertiary	4.4%	0%	7.7%	0%	
Total	**100%**	**100%**	**100%**	**100%**	
Experience					
± 2-5 years	11.1%	5.4%	5.1%	10.5%	0.902
>5-10 years	8.9%	8.1%	12.8%	10.5%	
Over 10 years	80.0%	86.5%	82.1%	78.9%	
Total	**100%**	**100%**	**100%**	**100%**	
Farmer group membership					
Member	48.9%	18.9%	23.1%	34.2%	0.016*
Non-member	51.1%	81.1%	76.9%	65.8%	
Total	**100%**	**100%**	**100%**	**100%**	
2. FARM CHARACTERISTIC					
Farm Size	0.55 ha	0.38 ha	0.5 ha	0.36 ha	0.03*
Cashew trees ownership					
Inherited cashew tree	40.0%	48.6%	74.4%	94.7%	
Self-cultivation tree	31.1%	43.2%	25.6%	5.3%	0.00*
Combinations (including government grant tree)	28.9%	8.1%	0.0%	0.0%	
Total	**100%**	**100%**	**100%**	**100%**	
Cashew trees number	38	28	35	28	0.442
Cashew production	1075 kg	413kg	375kg	200 kg	0.04*
Cashew farm arrangement					
Single cashew farm	28.9%	32.4%	30.8%	55.3%	0.05*
Mixed farming	71.1%	67.6%	69.2%	44.7%	
Total	**100%**	**100%**	**100%**	**100%**	

Note: * Sig = p value ≤ 0.05, Chi square was used for categorical data, and One Way Anova was used for numerical data

Table D3. 2. Current practice profile of each cluster

CURRENT PRACTICE		CLUSTERS				Sig
		Accelerators	Progressors	Inattentive	Conservative	
1. PRODUCTION						
Rejuvenation	Yes	53.0%	57%	8%	21%	0.00*
	No	47.0%	43%	92%	79%	
	Total	**100%**	**100%**	**100%**	**100%**	
Weeding	Yes	78%	70%	87%	79%	0.354
	No	22%	30%	13%	21%	
	Total	**100%**	**100%**	**100%**	**100%**	
Fertilising	Yes	58%	35%	56%	79%	0.103
	No	42%	65%	44%	39%	
	Total	**100%**	**100%**	**100%**	**118%**	
Pest and disease control	Yes	13%	3%	23%	37%	0.001*
	No	87%	97%	77%	63%	
	Total	**100%**	**100%**	**100%**	**100%**	
Pruning	Yes	82%	78%	31%	97%	0.00*
	No	18%	22%	69%	3%	
	Total	**100%**	**100%**	**100%**	**100%**	
Hedgerow agreement	Yes	82%	65%	8%	11%	0.00*
	No	18%	35%	92%	89%	
	Total	**100%**	**100%**	**100%**	**100%**	
Main family employment	Yes	76%	95%	82%	74%	0.082
	No	24%	5%	18%	26%	
	Total	**100%**	**100%**	**100%**	**100%**	
2. MARKETING						
Products	Dry in shelled nut	87%	70%	54%	55%	0.004*
	Wet in shelled nut	13%	30%	46%	40%	
	Combination	0%	0%	0%	5%	
	Total	**100%**	**100%**	**100%**	**100%**	
Volume	Wet in shell nut (kg)	459.67	415.45	415.28	168.82	0.397
	Dry in shell nut (kg)	1,066.72	374.46	311.29	190.11	0.022*
Price	Wet in shell nut (IDR)	15,250.00	16,818.18	18,222.22	17,411.76	0.004*
	Dry in shell nut (IDR)	16,871.79	17,000.00	20,119.05	19,217.39	<0.001*
Grading	Yes	16%	0%	28%	42%	0.000*
	No	84%	100%	72%	58%	
	Total	**100%**	**100%**	**100%**	**100%**	
Transaction	Same Buyer	22%	27%	64%	63%	0.000*
	Different Buyer	73%	70%	36%	34%	
	Combination	4%	3%	0%	3%	
	Total	**100%**	**100%**	**100%**	**100%**	
Transaction site	Farmgate/home	4%	14%	23%	53%	0.000*
	Market/buyers' site	96%	86%	77%	47%	
	Total	**100%**	**100%**	**100%**	**100%**	
Information searching	Yes	67%	84%	51%	74%	0.190
	No	33%	16%	49%	26%	
	Total	**100%**	**100%**	**100%**	**100%**	
Information sharing	No One	18%	8%	51%	29%	0.001*
	Neighbourhood farmers	78%	92%	49%	68%	
	Others	4%	0%	0%	3%	
	Total	**100%**	**100%**	**100%**	**100%**	
Price setting	Accepting price	89%	100%	79%	76%	0.130
	Negotiating	11%	0%	21%	24%	
	Total	**100%**	**100%**	**100%**	**100%**	
Helping neighbourhood	No helping	36%	35%	41%	84%	0.000
	Mutual help	64%	65%	59%	16%	
	Total	**100%**	**100%**	**100%**	**100%**	
3. CERTIFICATION &COORDINATION						
Certification	Yes	0%	0%	0%	0%	.[a]
	No	100%	100%	100%	100%	
	Total	**100%**	**100%**	**100%**	**100%**	
Coordination with others in farmer group	Yes	51%	81%	77%	66%	0.016*
	No	49%	19%	23%	34%	
	Total	**100%**	**100%**	**100%**	**100%**	
Coordination with stakeholders in training	Yes	98%	100%	97%	95%	0.544
	No	2%	0%	3%	5%	
	Total	**100%**	**100%**	**100%**	**100%**	
Coordination with stakeholders in supporting programs	Yes	4%	3%	0%	3%	0.638
	No	96%	97%	100%	97%	
	Total	**100%**	**100%**	**100%**	**100%**	

Note:

1) * Sig p value ≤ 0.05, with Chi square for categorical data, and One Way Anova for numerical data
2) .[a] is No statistics are computed because Certification Status is a constant

Appendix E. Statement of Contribution-Doctorate with Publications/Manuscripts

DRC 16

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UNIVERSITY OF NEW ZEALAND

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STATEMENT OF CONTRIBUTION
DOCTORATE WITH PUBLICATIONS/MANUSCRIPTS

We, the candidate and the candidate's Primary Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated below in the *Statement of Originality*.

Name of candidate:	DWI RATNA HIDAYATI
Name/title of Primary Supervisor:	Dr ELENA GARNEVSKA
In which chapter is the manuscript /published work:	2

Please select one of the following three options:

(●) The manuscript/published work is published or in press

- Please provide the full reference of the Research Output:

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021). Sustainable Agrifood Value Chain—Transformation in Developing Countries. Sustainability, 13(22), 12358. https://doi.org/10.3390/su132212358.

( ) The manuscript is currently under review for publication – please indicate:

- The name of the journal:
- The percentage of the manuscript/published work that was contributed by the candidate:
- Describe the contribution that the candidate has made to the manuscript/published work:

( ) It is intended that the manuscript will be published, but it has not yet been submitted to a journal

Candidate's Signature:	Dwi Ratna Hidayati
Date:	23-Feb-2023
Primary Supervisor's Signature:	Elena Garnevska
Date:	23-Feb-2023

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Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2021b). Transforming Developing Countries Agrifood Value Chains. Int. J. Food System Dynamics, 12(4), 358–374. https://doi.org/10.18461/ijfsd.v12i4.96

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Name/title of Primary Supervisor:	Dr ELENA GARNEVSKA
In which chapter is the manuscript /published work:	4

Please select one of the following three options:

(●) The manuscript/published work is published or in press

- Please provide the full reference of the Research Output:

Hidayati, D. R., Garnevska, E., & Childerhouse, P. (2023). Enabling sustainable agrifood value chain transformation in developing countries. Journal of Cleaner Production. Volume 395 (Available online 11 February 2023). https://doi.org/10.1016/j.jclepro.2023.136300.

( ) The manuscript is currently under review for publication – please indicate:

- The name of the journal:
- The percentage of the manuscript/published work that was contributed by the candidate:
- Describe the contribution that the candidate has made to the manuscript/published work:

( ) It is intended that the manuscript will be published, but it has not yet been submitted to a journal

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Date:	23-Feb-2023
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Date:	23-Feb-2023

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Name/title of Primary Supervisor:	Dr ELENA GARNEVSKA
In which chapter is the manuscript /published work:	5

Please select one of the following three options:

○ The manuscript/published work is published or in press

- Please provide the full reference of the Research Output:

◉ The manuscript is currently under review for publication – please indicate:

- The name of the journal:

British Food Journal

- The percentage of the manuscript/published work that was contributed by the candidate: 80.00
- Describe the contribution that the candidate has made to the manuscript/published work:

The candidate was responsible for conceptualisation, data collection,analysis, interpreting findings, writing majority of the paper, responding to the reviewer, and revising the paper

○ It is intended that the manuscript will be published, but it has not yet been submitted to a journal

Candidate's Signature:	Dwi Ratna Hidayati
Date:	23-Feb-2023
Primary Supervisor's Signature:	Elena Garnevska
Date:	23-Feb-2023

This form should appear at the end of each thesis chapter/section/appendix submitted as a manuscript/ publication or collected as an appendix at the end of the thesis.

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