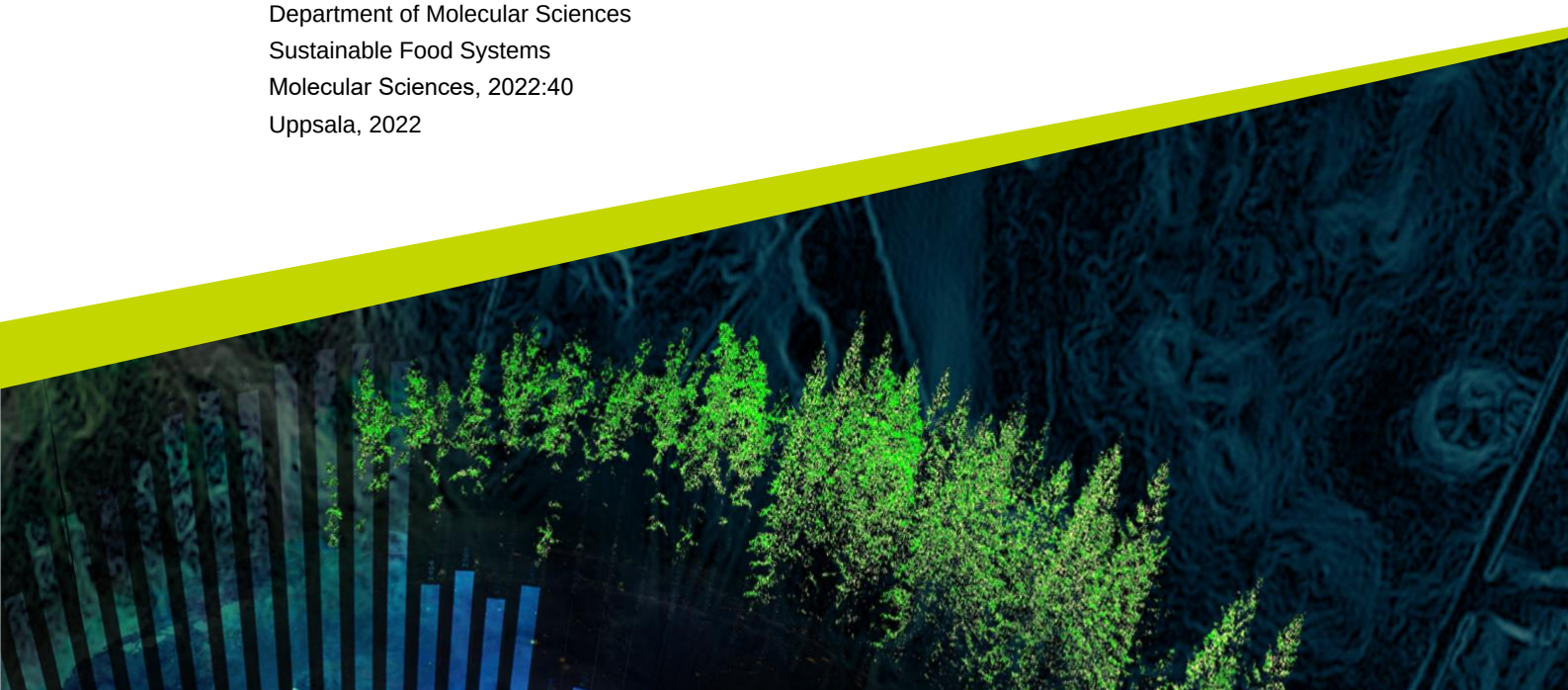
Service dominant logic for actor-to-actor co-creation of value and sustainability outcomes

– case studies of five actors in the Swedish legume industry

Eric Lwin

Degree project/Independent project • 30 hp
Swedish University of Agricultural Sciences, SLU
Department of Molecular Sciences
Sustainable Food Systems
Molecular Sciences, 2022:40
Uppsala, 2022



Service dominant logic for actor-to-actor co-creation of value and sustainability outcomes – case studies of five actors in the Swedish legume industry

Eric Lwin

Supervisor:	**Cecilia Mark-Herbert, Department of Forest Economics**
Examiner:	Erik Hunter, Department of People and Society

Credits:	30 hp
Level:	Advanced Level, A2E
Course title:	Master Thesis in Food Science
Course code:	EX0875
Programme/education:	Sustainable Food Systems
Course coordinating dept:	Department of Molecular Sciences
Title of series:	Molecular Sciences
Part number:	2022:40
Place of publication: Year of publication:	Uppsala 2022

Keywords: collaboration, innovation, service ecosystem, institutional logic, business administration

Swedish University of Agricultural Sciences
Faculty of Natural Resources
Department of Molecular Sciences

Publishing and archiving

Approved students' theses at SLU are published electronically. As a student, you have the copyright to your own work and need to approve the electronic publishing. If you check the box for **YES**, the full text (pdf file) and metadata will be visible and searchable online. If you check the box for **NO**, only the metadata and the abstract will be visible and searchable online. Nevertheless, when the document is uploaded it will still be archived as a digital file.
If you are more than one author you all need to agree on a decision. Read about SLU's publishing agreement here: https://www.slu.se/en/subweb/library/publish-and-analyse/register-and-publish/agreement-for-publishing/.

☒ YES, I/we hereby give permission to publish the present thesis in accordance with the SLU agreement regarding the transfer of the right to publish a work.

☐ NO, I/we do not give permission to publish the present work. The work will still be archived and its metadata and abstract will be visible and searchable.

Abstract

Shifts to less energy intensive diets based on plant protein are necessary to meet the food demands of 2050. High protein crops such as legumes are a solution that confers farm-level and societal benefits. However, Sweden lacks the physical, societal, and political infrastructure needed for improved production and consumption. Currently, several market-facing, public and private institutions are acting to innovate and collaborate to develop new products, networks, and systems for market development of legumes and legume-based meat and dairy alternatives. This study explains how actors perceive and act on the environmental, social, and economic potential of legumes through semi-structured interviews. This qualitative data was analysed through the service-dominant logic (SDL) framework with the aim to understand which factors of the legume network need further development.

The study involves five actors which include a legume wholesaler, legume-based cheese processor, food system innovation incubator, a multistakeholder network for collaboration and a project for improving school meal systems. Overall, the actors understand the sustainability potential of legumes and show strong collaborative competencies for innovation, marketing, and some national level policy interactions. The results also show the importance of public and private institutions in facilitating transparent resource exchange for the co-creation of value. However, stronger EU-level policy interactions are needed which can influence the sociotechnical regime. Moreover, customer knowledge needs development for improving customer operant resources so that value propositions can be fully understood. Thus, marketers should consider the different product attributes of different legume varieties and legume-based meat and dairy alternatives when developing marketing strategy. This is important when considering trends such as local food which have the potential to be marketed to certain target markets albeit with unclear sustainability trade-offs. To address these issues, the SDL framework suggests that actors should consider coordinated multi-stakeholder collaboration within overlapping institutional logics for comprehensive development of firm strategy, national and EU-level policy for valorising the environmental and social impacts of legume production and consumption for improving farm level viability and customer acceptance

Keywords: collaboration, innovation, service ecosystem, institutional logic, business administration

Table of contents

List of tables

List of figures

Abbreviations

Abbreviation	Word/phrase	Page
A2A	Actor-to-actor	9
CAP	Common Agricultural Policy	1
CO_2-eq	Carbon dioxide equivalents	39
CSR	Corporate social responsibility	9
EU	European Union	19
FP	Foundational premise	5
GDL	Goods-dominant logic	4
LBA	Legume-based meat and dairy alternative	39
LoBa	Local Legume Network (Lokala Baljväxtnätverket)	28
NRSM	New Recipe for School Meals	30
SDL	Service-dominant logic	4
SLV	Swedish Food Agency (Livsmedelsverket)	57
SNA	Social network analysis	17

1. Introduction

Projections for population growth to 10 billion inhabitants and trends to more resource intensive diets by 2050 show the need for crisis mitigation strategies on farm, processing, consumer, and policy levels (Bajželj *et al.* 2014, Searchinger *et al.* 2014). One option to address the issue of intensive diets is through increased consumption of protein crops on a global scale. Studies show that legumes play a critical role in meeting future protein demands whilst also meeting sustainable environmental and health outcomes (Willet *et al.* 2019; Röös *et al.* 2020). However, on a national scale in Sweden, 80% of locally grown legumes is used as animal fodder and only 3% is consumed in Sweden (Röös 2020). According to consumer reports, consumption of legumes remains low at 12 grams per day (Swedish Food Agency 2012). This is a stark contrast to 50 grams a day as recommended by The Lancet (Willet *et al*. 2019). Additionally, Sweden lacks local processing facilities for boiling and packaging leading to transport to international facilities and greenhouse gas emissions equivalent to importing legumes from China (Tidåker *et al.* 2021). Overall, lack of processing infrastructure and low consumption indicates underdevelopment of the Swedish legume system.

Moreover, the COVID-19 pandemic has impacted global food supply chains by restricting workers, trade and changing consumer habits (Hobbs 2020). In light of this, Sweden, which imported 61% of agricultural products and foodstuffs in 2019 lacks resilience in times of unexpected crises (SCB 2020). Since the pandemic, Sweden has released a food strategy for increased local production of food alongside the 2023 European Union's Common Agricultural Policy (**CAP**) which features anticipated support for legume cultivation (Swedish Government 2020; EC 2021). While recent policy updates show promise for boosting local legume production, consumer demands for innovative, convenient, and flavourful products must also be met accordingly. Therefore, realizing the benefits of legume requires long term actor collaboration along the whole value chain. There exists previous research explaining the potential of legumes for cropping systems, product development, as well as climate, health, and land-use impacts (Röös *et al.* 2018; Ferawati *et al.* 2019; Jensen *et al.* 2020; Ferawati *et al.* 2021; Tidåker *et al.* 2021). However, only one study was found researching activities of actors within the legume value chain in Sweden (Olsson 2017). Interestingly, several firms and institutions are in the process of developing or have already launched products

based on Swedish legumes. Examples include, Bärta - a fermented yellow pea protein alternative (Bärta n.d.), Färsodlarnas Baljväxtfärs – a minced meat analogue developed with collaborations from a non-profit organisation (Axfoundation n.d.; Färsodlarna n.d.) and Gropro – a pea protein concentrate production facility (Dagligvarunytt 2022). Further interesting examples include firms which source legumes internationally such as Stockeld Dreamery – a feta cheese alternative (Stockeld n.d.) and Peas of Heaven – processed meat analogues (Peas of Heaven n.d.), both of which have received significant funding. Considering these developments, this study aims to fill the research gap, explaining how actors understand and interact with the legume value chain and the wider institutional environment to solve problems for mutual benefit.

1.1. Problem Background

Legumes are posited as an important future source of plant-based protein, however from both infrastructure and consumer acceptance perspectives, the legume system is highly underdeveloped in Sweden. This section outlines challenges and prospects of legumes in a Swedish context.

1.1.1. Environmental aspects of legumes

An important environmental attribute of legumes is their ability as nitrogen fixators to bind nitrogen in soil which acts as a natural fertilizer. The roots of leguminous plants house symbiotic rhizobia bacteria which converts free nitrogen gas to ammonia. Therefore, cropping systems which incorporate legumes would reduce the need for synthetic fertilizers (Meena & Lal 2008). Alternate cropping methods such as intercropping with legumes also evidence increased pest, weed and disease resistance. While legumes show potential for improved sustainability outcomes, on the farm level, increased cultivation of legumes is directly linked to seed and climate suitability, farmer knowledge and the availability of extension services (Olsson 2017; Röös *et al.* 2020). This proves a challenge for Sweden which has an underdeveloped production and consumption of leguminous crops.

In addition to cultivation, transport and processing pose significant barriers to the environmental sustainability of legumes. Currently, the closest facility to process and package boiled legumes for consumer convenience is located in Italy. Due to this, legumes cultivated in Sweden and processed in Italy result in similar carbon dioxide emissions to those shipped from USA and China (Tidåker *et al.* 2021). Thus, one option to reduce emissions transport is to establish local processing facilities.

1.1.2. Social aspects of legumes

Shifts to less energy intensive diets is critical in supporting future population growth to 2050 (Bajželj *et al.* 2014). Protein crops are thus an integral solution to meeting the future protein demands in addition to providing more dietary fibre, unsaturated fatty acids, and folate per weight unit than meat. However, Swedish consumers only consume 25% of the recommended intake of legumes in comparison to the planetary diet presented by The Lancet (Willet *et al.* 2019). The current low levels of legume consumption present a challenge to marketers and learning institutions; how can legumes be promoted effectively on a national scale? Solving this issue is dependent on a firm's ability to create innovative products, with the appropriate attributes which appeal to consumer markets. Moreover, effectively marketing these products with appropriate packaging, labelling and claims is tied to the ability of customers to discern and value the presented information. The inherent dependence of upstream and downstream actors, modulated by supporting institutions in the legume value chain leads to a complex and dynamic interaction. Furthermore, outside the direct food industry, profitability of Swedish legume cultivation is also linked to developments in biofuel industries which could create a portfolio diversification effect for farmers and wholesalers (The Swedish Society for Nature Conservation 2014:26).

1.2. Aim and research questions

Legumes possess the potential for environmental, social, and economic benefits on the Swedish market. However, according to service-dominant logic, a theory explained in the next section, success of public and private entities is dependent on how actors cooperate. Therefore, the aim is to explain how actors perceive and act on the environmental, social, and economic potential of legumes. The study will map different actors which stand to gain from the different benefits of increasing legume production, processing and consumption and assess their collaboration. Actors include public and private sectors such as consumer groups, environmental policy makers, farmers, wholesalers, processors, and researchers.

- How do different actors understand the function of legumes for environmental, social, and economic outcomes?
- How do actors collaborate with other actors to overcome issues in the value chain?
- What changes are necessary to stimulate development of the legume value chain?

2. Theoretical Framework

This section outlines the theoretical framework chosen for the study and the reasoning for its suitability for the research.

2.1. Service-dominant Logic

Service-dominant logic (**SDL**) is a theory from marketing science that presents a fundamental paradigm shift from goods-dominant logic (**GDL**). According to GDL, goods or outputs are the primary basis of value exchange. In this exchange of goods-for-money, value is created by a firm, embedded in a good, exchanged at the point-of-sale and destroyed by the customer through consumption as shown in figure 1. Value is destroyed in the sense that the consumer is unable to perceive and appreciate the total benefits of the product (Lintula *et al. 2017).* Within the GDL model, the firm lies at the centre of value generation as a producer, innovator, investor, and distributor. Moreover, the value-in-exchange ends at the point of sale and maximum efficiency occurs through standardization and economies of scale (Vargo *et al.* 2008:147). This inherently ties value to monetary exchange and limits broader social perspectives and economic processes. This marketing perspective follows neoclassical economic theory and bares strong contrast to SDL.

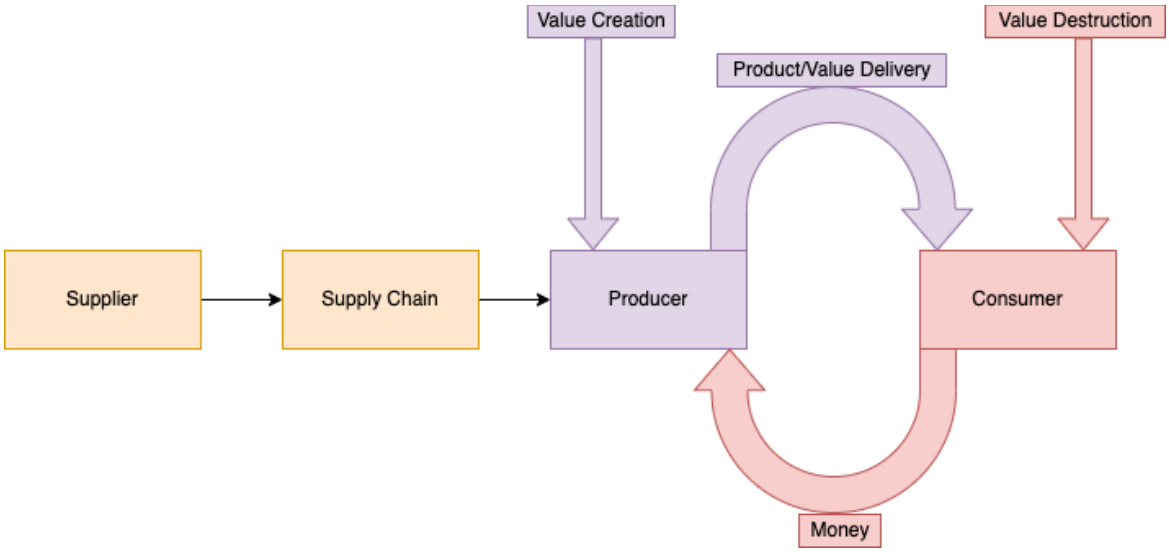


Figure 1. The firm-centric flow of goods in goods-dominant logic (Lusch & Vargo 2014:9).

Table 1. Foundational premises of service-dominant logic (Lusch & Vargo 2014:15; Vargo & Lusch 2016)

Foundational Premise	Premise	Justification
FP1	Service is the fundamental basis of exchange.	The application of operant resources (knowledge and skills), 'service', is the basis for all exchange. Service is exchanged for service.
FP2	Indirect exchange masks the fundamental basis of exchange.	Goods are exchanged for the service they provide rather than the good itself.
FP3	Goods are a vehicle or distribution mechanism for service provision.	Implies that intangible attributes are integral to value propositions
FP4	Operant resources are the fundamental sources of competitive advantage.	The application of knowledge is the main contributor of value.
FP5	All economies are service economies.	Need satisfaction is the basis of economic exchange.
FP6	Value is cocreated by multiple actors including the beneficiary.	Implies value creation is interactional and combinatorial
FP7	Actors cannot deliver value but can participate in the creation and offering of value propositions.	Implies that the context of the customer is a determinant factor in value creation.
FP8	A service-centred view is inherently beneficiary oriented and relational.	Value cocreation involves understanding the beneficiary and their context.
FP9	All economic and social actors are resource integrators.	Implies the context of value creation is networks of networks (resource-integrators).
FP10	Value is always uniquely and phenomenologically determined by the beneficiary.	Value is idiosyncratic, experiential, contextual, and meaning laden.
FP11	Value cocreation is coordinated through actor-generated institutions and institutional arrangements.	Institutions provide the glue for value cocreation through service-for-service exchange.

SDL is broken down into 11 foundational premises (**FP**) which will be explained in this section and are presented in table 1 above. The strategic applications of the foundational premises are then clarified in section 2.4. One contrast that SDL makes is that of *'services'* and *'service'*, that is necessary to elucidate (an extended list of definitions can be found in appendix 2, table A1). The plural *'services'* refers to the

neoclassical definition of an intangible good or value-enhancing addition to goods. According to SDL, *'service'* is a process of integrating competencies rather than a quantifiable unit of output. Moreover, the word beneficiary is used as opposed to consumer. In GDL, consumers refer to the end of the value chain and destroy value. Whereas in SDL, a beneficiary is a more appropriate term for the end-user because beneficiaries integrate their own intangible resources such as knowledge and skills, also known as operant resources in SDL (see appendix 2), to engage in value propositions (Lusch & Vargo 2014). In this context, value propositions are a type of transaction that goes beyond the exchange of money. According to SDL, goods are not purchased for the good in itself, but rather the service it facilitates to satisfy a customer's specific need, the intangibles that are associated with a brand, and social context of the purchase (Lusch & Vargo 2014). From henceforth, the words beneficiary and customer will be used in place of consumer and value proposition in place of transaction unless when specifically referring to conventional GDL. This leads to the first foundational premise which lays the foundation for the other premises: that *service is the fundamental basis of exchange* (FP1). For example, cars in themselves have no value, the value lies in being able to travel from point A to B. Additionally, cars may be purchased for additional service qualities such as social status (a high-performance sports vehicle), sustainability (a hybrid vehicle) or social context (an all-terrain or 7-seater family vehicle). Thus, *indirect exchange masks the fundamental basis of exchange* (FP2), which reflects traditional brand marketing theory. From these premises, it follows logically that *goods are a distribution mechanism for service provision* (FP3) and that *all economies are service economies* (FP5). An inherent consequence of this is that how actors integrate operant resources to provide service becomes a key point of differentiation and source of competitive advantage (FP4).

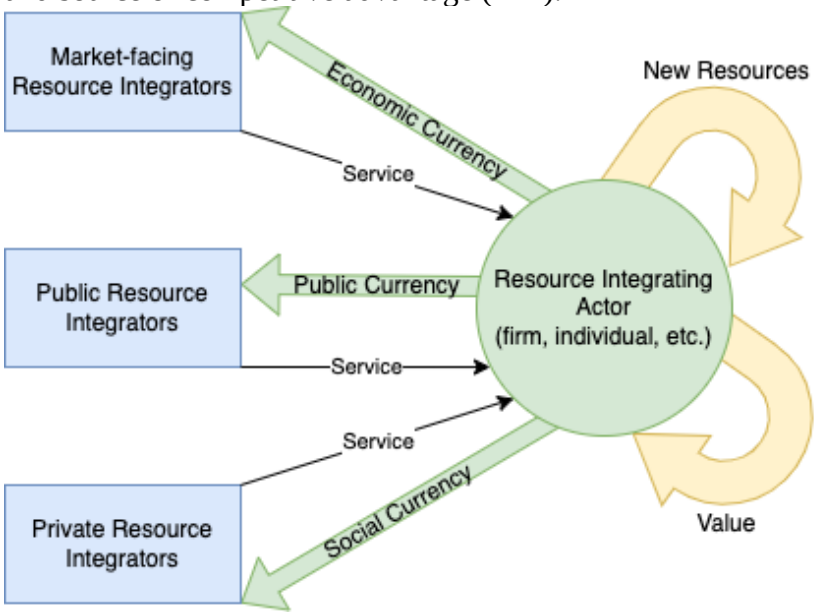


Figure 2. Value cocreation through resource integration and service exchange (Vargo et al. 2008).

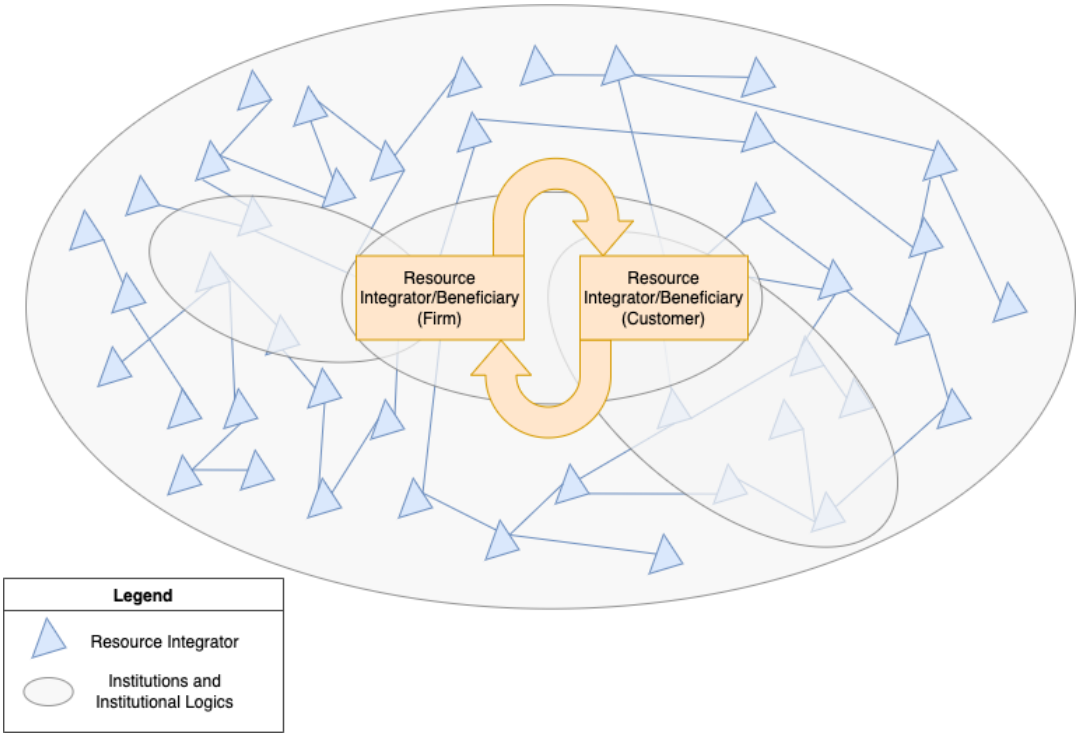


Figure 3. Resource integration and service exchange in service ecosystems (Vargo 2008).

The sixth foundational premise is that *value is cocreated by multiple actors including the beneficiary* (FP6). Rather than the producer being the total creator of value (see figure 1), value is partly determined by interactions with other actors in SDL. For example, a hybrid vehicle would be of little value if a potential customer had no concept of sustainability. Inversely, a sports vehicle may be associated with consumerism and wastefulness thereby reducing its perceived value. This example resonates with FP7 and FP10 respectively, that *actors cannot deliver value but can participate in the creation of value propositions* and that *value is always uniquely and phenomenologically determined by the beneficiary*. These premises show that it is the actor-to-actor context which enables the acceptance of a value proposition. The strategic consequence for firms is that need-satisfaction is meaning laden and must be holistic in approach. Therefore, *a service-centred view is inherently beneficiary oriented and relational* (FP8).

FP9 states that all *economic and social actors are resource integrators*. This is shown in figure 2, where actors draw from market-facing, public and private resources which are combined to cocreate new resources and value. This newly created value may be monetary, or competency based and can be used to attain new resources. For example, cars have little value without the service ecosystem of necessary infrastructure such as roads, traffic lights, parking spaces, and petrol fuelling stations and their associated networks. Therefore, the competitive advantage of a vehicle manufacturing firm is linked to service providing competencies and resources outside of the firm in addition to the social context.

Thus, we see that *value cocreation is coordinated through actor-generated institutions and institutional arrangements* (FP11). This is shown in figure 3, where resource integrators consist of smaller actor-to-actor interactions and institutional frameworks which creates an expanded service ecosystem.

2.2. Completing the SDL narrative

Within SDL, the unit of analysis is the entire network of resource integrating actors connected by institutional arrangements and mutual value cocreation through service exchange (Vargo & Lusch 2017). Institutional logics vary in size and influence on exchange in service ecosystems which set the parameters for value cocreation as depicted in figure 3. Inversely, exactly how smaller constellations interact with actors and institutional logics dynamically effects larger constellations which then influences the context of future interactions. This phenomenon is illustrated in figure 4 where constellations or levels of aggregations are divided into micro, meso and macro levels referring to dyadic exchange, market and societal respectively.

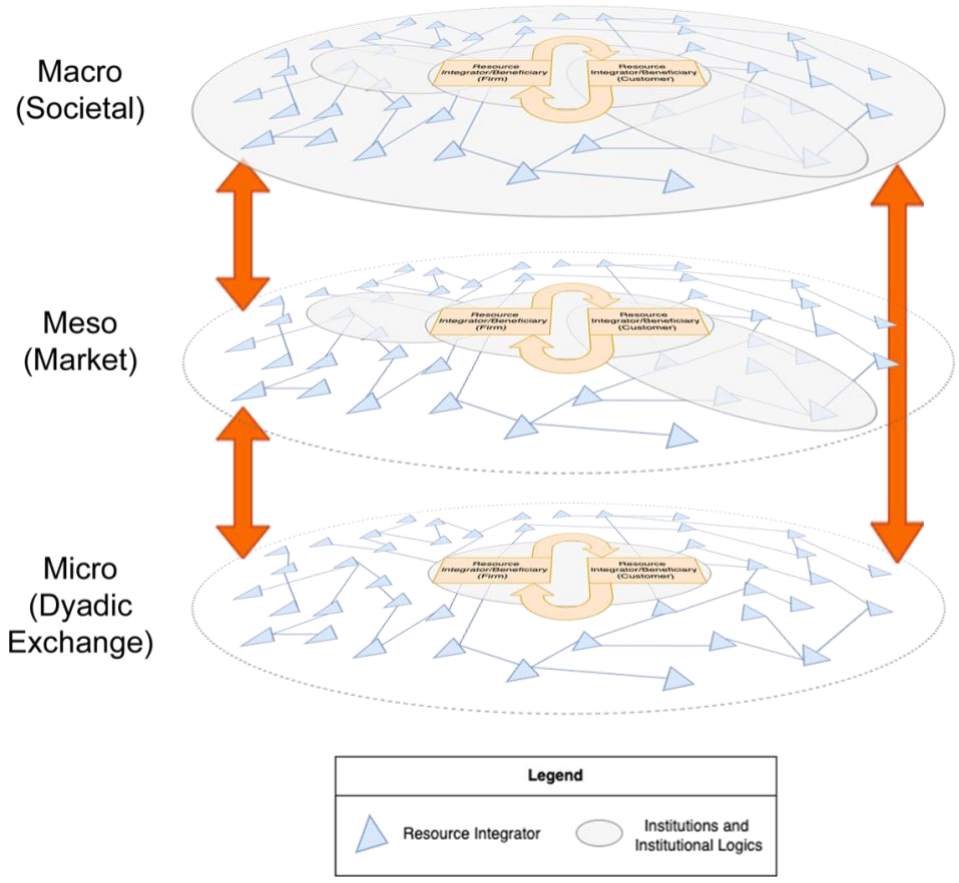


Figure 4. Exploded model of institutional service exchange on the micro, meso and macro levels (Akaka et al. 2013).

Vargo and Lusch (2017), highlight that each level of exchange bears equal importance as actor actions cannot be fully understood without analysing the market nor societal context. The consequence for actors is that the micro level value exchange is mediated by how firms integrate resources in their value chain and institutional framework on the meso and macro levels. Similarly, whether a value proposition is accepted by the customer is dependent on the societal context of familial structures, education, and dominant ideologies. This has strong implications for firm strategy and competitive advantage whereby applied knowledge through collaboration generates greater value. This process can be achieved by firms only if external environments, customers, and partners are integrated as resources. Thus, the competency to cocreate becomes the key source of competitive advantage in the SDL framework (Lusch *et al.* 2007; Karpen *et al.* 2012).

2.3. Service Dominant Logic and Sustainability

One may notice that premises of SDL reflect pivotal marketing theories of corporate social responsibility (**CSR**), shared value, consumer culture theory and relationship marketing. However, societal, and ethical issues are not a core focus of SDL, rather the framework exists as a generic theory of exchange that can be expanded upon. Vargo and Lusch (2008) suggest that SDLs narrative of 'value cocreation to mutually serve' counters the GDL perspective of creating more units of output to sell. Building on this, it is theorised that the actor-network centricity of SDL bears an inherent integration of ethics and reduces externalisation of social and environmental issues (Abela & Murphy 2008).

In recent years, many scholars have applied the SDL framework through a sustainability perspective in different industries from marketing and business strategy to ecosystem and forestry management, tourism, education, and packaging design (Matthies *et al*. 2016; Roos *et al.* 2018; Díaz-Méndez *et al.* 2019; Williams *et al*. 2020; Font *et al*. 2021). One useful aspect of SDL is its analytical applications on micro, meso and macro levels. For example, on a micro firm strategy level, Williams *et al.* (2020) shows that integration of SDL in food packaging design can help firms understand the customer value creation process resulting in innovative designs and waste reduction. On the meso level, it is shown that SDL builds actor-to-actor (**A2A**) relationships for improved strategic competencies across whole value chains (Karpen *et al.* 2012). Finally on the macro level, Matthies *et al.* (2016) integrates the ecosystem service framework with SDL to show how service links all resource integrating actors on economic, societal, and environmental dimensions.

The applicability of SDL on multiple levels of firm activities links firm microprocesses to the macro scale and makes it useful for this thesis study. For example, firms can actively improve their sustainability impact by adopting new processes or changing materials in accordance with customer values. This change contributes to the total attributes of the product and presents customers with a new value proposition. Alongside direct firm activities, resource integration from public, private, and regulatory actors are necessary to maintain chain credence values and provide support services. For example, through institutional frameworks that promote innovation and reliable supply chains. As all actors are resource integrators, they stand to gain or lose depending on how relationships are maintained and therefore have a strong incentive for long term collaboration. Furthermore, according to the SDL framework, how such value is perceived by the beneficiary is also of significant importance. This impacts how marketers communicate product attributes through regular marketing channels such as advertising, labelling, and packaging as well as how firms collaborate with educational institutions and certifications.

In the case of organic produce, firms account for externalities through sustainable ecological practice which results in a sustainability value proposition. This organic system is also supported by agricultural policy which set enforceable standards, non-government organisations which enforce those standards and learning institutions which provide research for improved practice. An occurrence of food fraud could reduce credibility of organic systems and lower customer confidence. Consequently, this change in demand would impact farm, firm and regulatory systems. The dynamic systems nature of all actors involved in the food industry leads to the need for systems approaches to create secure and sustainable supply chains that drive consumer knowledge and confidence and vice versa.

Regarding systems, Ericksen (2008) highlights the importance of multi-level and cross-scale interactions for investigating social, environmental, and economic outcomes of food system activities. While relevant and invaluable, Ericksen (2008) investigates broadly on all activities with special reference to food security outcomes. In contrast, this thesis takes a firm-centric view on how firms perceive and interact with the system to create competitive advantage. SDL provides the framework for investigating firm processes at micro, meso and macro levels to understand how firms perceive the attributes of the products or services they offer as well as engage with other actors to co-create value.

2.4. Applications of SDL in the legume context

When applying SDL to the legume system, three key questions arise that must be explicitly answered for analysis, simplified in table 2. (1) What is value in the context of the study? Value in this study is defined from a macro sustainability perspective as the potential environmental, social, and economic benefits of legumes in diets and ecosystems which is discussed in the empirical background section. Secondly, it is important to discuss (2) to whom this value is for? According to Vargo and Lusch (2017), the network is the unit of analysis, with micro, meso and macro levels bearing equal importance. Clearly, transactions are bidirectionally linked to positive outcomes for firms, public goods, and societal values. Additionally, the ability of a firm to offer an attractive value proposition is dependent on its intra- and inter-firm competencies. Lastly, (3) how is this value generated? Improved total sustainability outcomes are generated through a complex network at interactions at micro, meso and macro levels. On the micro scale, the value proposition is an interaction of how a firm can integrate research, innovation, entrepreneurship, and strategic marketing competencies. From the beneficiary perspective, the ability to appreciate a sustainability value proposition is dependent on physical qualities such as taste and price as well as knowledge of sustainability issues. At the meso level, network value is generated through how organisations collaborate to foster development through agricultural and entrepreneurial funding, educational institutions for research and public knowledge.

Table 2. Defining value in the context of the study

Question	**Answer**
What is value?	The total sustainability outcomes provisioned by legumes
Who gains from value?	Individual actors, networks, and the total service ecosystem
How is value generated?	Economic, social, and environmental value is generated through dyadic, market and societal integration of operand and operant resources

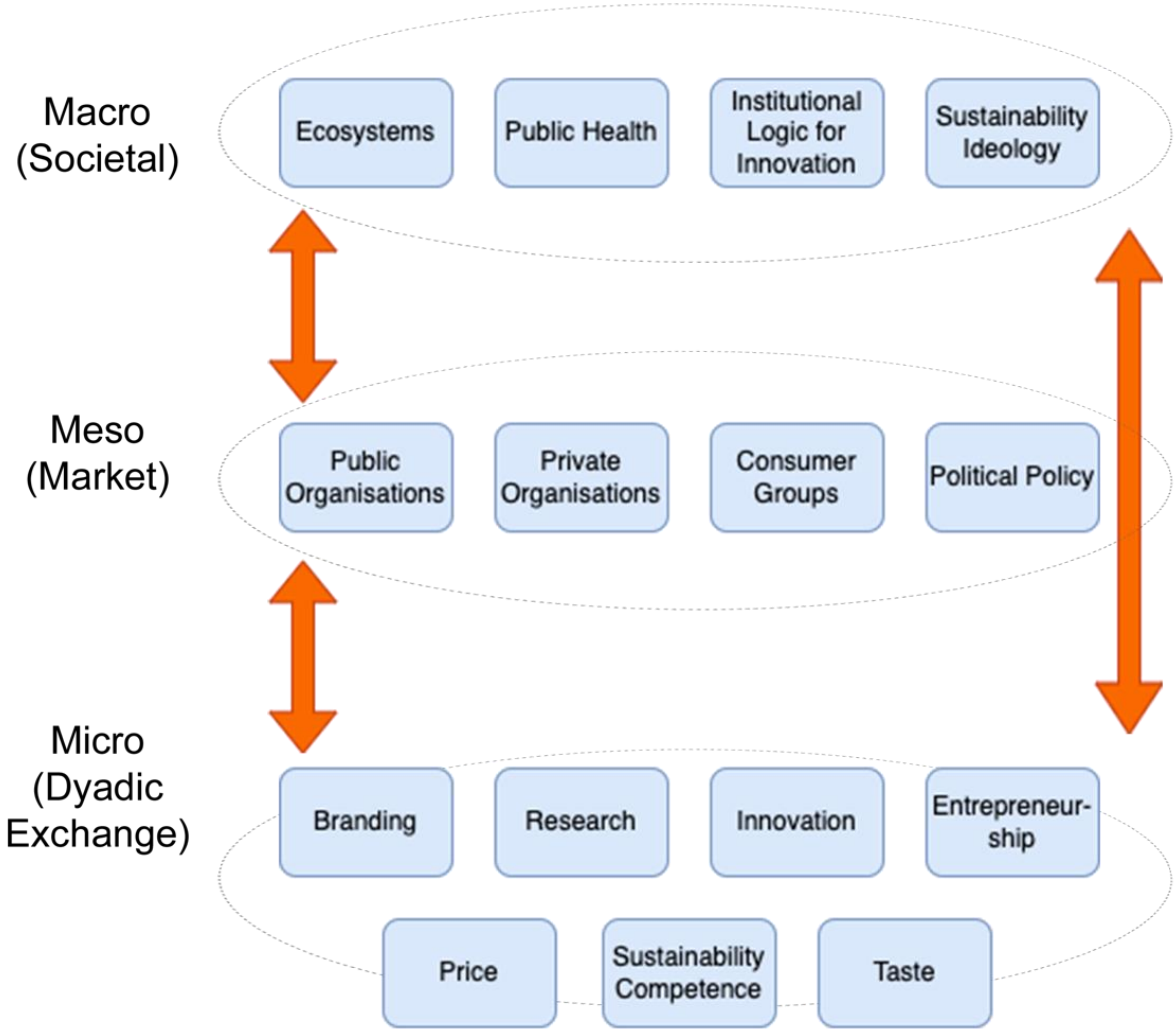


Figure 5. Institutions and institutional logics in the legume service ecosystem.

Lastly on the macro level, how the sociotechnical regime of innovation and entrepreneurship effects ecosystems, public health, and sustainability ideology. These service factors are visualized in figure 5 above. The complex interactions on micro meso and macro levels suggest that firms need to engage actors on multiple scales for value generation (Grönroos & Gummerus 2014). To place the service ecosystem in the physical context, the institutional logics have been illustrated parallel to the physical value chain which depicts the flow of goods in figure 6 below.

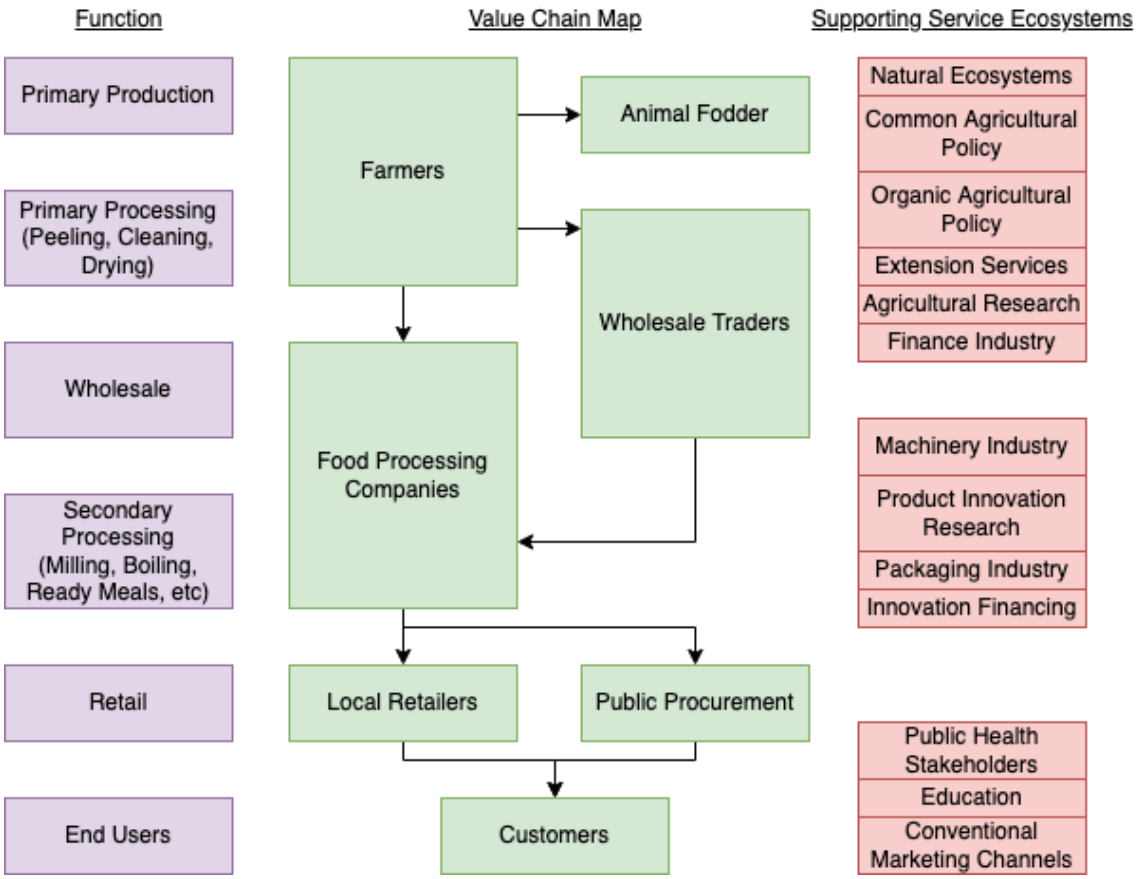


Figure 6. Map of the legume value chain and supporting service ecosystems.

The underdeveloped nature of the Swedish legume value chain, the variety of different actors and potential for environmental, social, and economic outcomes indicates a complex interaction between overlapping institutional arrangements. Therefore, analysis through the SDL framework offers insights as to how actors interact with other actors to overcome issues of underdevelopment. Discussed in this paper so far, SDL has been explored theoretically, implying the integration of resources from multiple actors and institutions for value cocreation within service ecosystems. To apply SDL, it is necessary to link the premises to strategic implications. Karpen *et al.* (2012) conceptualize a strategic orientation for SDL through an in-depth review of SDL literature. The study groups FPs by strategic themes and interprets them to strategic managerial consequences. As shown in table 3 below, these strategic consequences have been further classified into economic, social, and environmental consequences to suit the scope of this study.

Table 3. Linking service dominant logic to strategic themes, economic, social, and environmental outcomes (Adapted from Karpen et al. 2012)

Foundational Premises (FP)	**Strategic Implications**	**Economic Consequences**	**Social Consequences**	**Environmental Consequences**
Value is uniquely and phenomenologically determined by the customer (FP 7, 10)	Understanding individual customers' resource integrations processes context, and desires	Understand the customers' willingness to pay for certain services	Understand the norms and ideas of the customer's societal context	Understand the environmental context of the customer to better serve their needs
Customers are social relationship partners not isolated targets, with whom collaborative relations are favourable (FP 6, 7, 8)	Communicating with and relating to individual customers facilitating socioemotional comfort	Customer dialogue can be used for iterative improvement	Build social communities around brands and firm culture	Create dialogue around environmental issues and key selling points
Ethical standards of interaction support sustainable and transparent exchange with customers for the long-term benefit (see FP 1, 10, 11)	Engaging with individual customers in fair and nonopportunistic ways	Develop greater trust and engagement to the firm and reduce threat of competition	Realize direct and knock-on effects of sustainability value co-creation	Measure and realize long-term benefits of good environmental practice
Customers are operant resources that are able to contribute to the improvement of resources and desired solutions (FP 6, 9)	Empowering individual customers to influence the service processes and outcomes	Customers establish bidirectional channels to firm resources	The potential for coproduction enhances the societal achievement of functions	Operant resources are inherently linked to desired sustainable consumer solutions
All resource integrators' ability to cocreate value depends on their own access to knowledge and skills (FP 4, 6, 9)	Helping individual resource integrators to develop their own capabilities and knowledge	Resource integrators have a greater willingness to pay, and resources integrators are more willing to collaborate	Resource integrators are able gain more from the value-in-use	Resource integrators have a greater awareness of environmental issues
Service manifests itself in interlinked value cocreation processes within and among networks that customers are part of (FP 1, 6, 9)	Coordinating and integrating the service network for stronger relationships and service flow	Actors gain from strong relationships and resource efficiency	Customers experience less value drains as cocreation constellations operate smoothly	Network has a greater resource efficiency and transfer of knowledge
Service means assisting partners in achieving mutual betterment (FP 1-11)	Facilitate and enhance the direct/indirect interaction processes forming the basis for effective and efficient resource integration	Actors realize the full economic benefit associated with resources and interaction experiences	Actors realize the full social benefit associated with resources and interaction experiences	Actors realize the full environmental benefit associated with resources and interaction experiences

3. Method

This section outlines the foundations for how the methodological approach, actors involved, theoretical framework were chosen and how the interview was designed for this study.

3.1. Research approach

The study uses a qualitative study with an inductive approach to understand the context of actor interaction within the legume value chain in the form of 5 case studies. The qualitative approach allows the understanding of how phenomena are formed by the context in which they occur (Maxwell 2004). Moreover, qualitative analysis is invaluable where assigning quantitative value in a broad systems context is difficult in dynamic food systems fraught with sustainability trade-offs (Ericksen 2008). In the context of this study, this is interpreted as how actors make sense of prospects and challenges in the value chain and act accordingly. According to Fidel (1984), the case study approach is appropriate for investigating phenomena which high variability in factors and relationships, and where there are no basic laws that form the basis of the phenomena. Thus, given the underdeveloped nature and the evolving narrative of the Swedish legume system, a case study approach is appropriate. The thesis consists of five case studies of different actors in the legume system, primary data was gathered through semi-structured interviews, and the context of the study is established through a literature review.

3.1.1. Literature review

A literature review was performed to determine the underlying problems and potential of legumes. The study has a systems focus and therefore broadly explores environmental, social and economic aspects across the whole value chain. The study considers both local and global perspectives of cultivation, processing, and consumption to better contextualize the Swedish system. Google Scholar and the Swedish University of Agricultural Science library search engines were used to gather data with combinations of search terms such as legumes, processing, cultivation, consumption, barriers, challenges, prospects, and policy . Following the search process, a systematic review was conducted from the search results as

suggested by Xiao & Watson (2019). Firstly, the title was reviewed for relevancy and then the abstract was screened for inclusion. Thereafter, the full text was reviewed for quality assessment and the relevant information was extracted from the text for analysis. To reduce bias and ensure validity, multiple sources were screened. Due to the scope of the study being based in Sweden, searches were conducted in English and Swedish to attain relevant information which may not be available in another language.

3.1.2. Choice of actors

Due to the network structure of the intended analysis, a range of actors with varying roles have been selected. The involved actors listed in table 4 offer different perspectives on cultivation, processing, consumption, and network collaboration. Another criterion for actor selection was based on recent activity within the value chain. There is a variety of existing actors within the legume system, however, actors with recent activity are considered most interesting for this study due to their potential for innovation and interacting with the legume system in ways that existing actors have not historically done.

Table 4. List of actors involved in the study

Actor	Role	Interview Form	Date of interview	Date of Validation
Axfoundation	Non-government organisation focused on food system innovation	Online, Zoom, semi-structured interview	2022-02-11	2022-05-17
Local Legume Network (Lokala Baljväxtnätverket)	Multi-stakeholder network for connecting actors within the legume value chain	Online, Zoom, semi-structured interview	2022-02-15	2022-05-18
New Recipe for School Meals	Multi-stakeholder project for streamlining of school meal procurement and curriculum change	Online, Zoom, semi-structured interview	2022-02-07	2022-05-06
Nordisk Råvara	Heritage legume wholesaler focused on sustainable production and close ties to farm level challenges	Online, Zoom, semi-structured interview	2022-02-03	2022-04-27
Stockeld Dreamery	Legume-based cheese processing start-up	In-person, semi structured interview	2022-02-08	2022-05-03

3.1.3. Interview design

A semi-structured interview design with open ended questions was used in this study. This method was deemed more appropriate than unstructured or structured interviews due to the interviewers existing knowledge of the legume system and the research goal to glean information about respondents' actions and perspectives (Leech 2002). Questions were devised based on preliminary research outlining prospects, challenges, and recent developments within the legume value chain. Moreover, questions were created and thematically analysed in reference to the theory and applications of service-dominant logic (see tables 1, 2 and 3). The interview guide is available in appendix 3. Furthermore, background information on participating firms was conducted to develop a broader understanding of business operations so that prompting or follow-up questions could be asked. The interview questions were sent to respondents beforehand to ensure that they understood the scope of the questions and that the appropriate representative was responding. In addition, a privacy statement was supplied which outlined the respondents right to withdraw from the study at any time. Out of five interviews, four were held online on the meeting application Zoom and one was held in-person. All meetings were recorded with permission of the respondents and the material used to produce this study was validated as indicated in table 4 above.

3.1.4. Choice of theory

This study deals with a breadth of complicated interactions between firms, customers, value chains and their supporting industries, ecosystems in the context of sustainability. Service dominant logic, which is discussed in section 2, was deemed appropriate for the study due to its applications within systems on micro, meso and macro levels. Another consideration for the theoretical framework was value chain analysis which focuses on micro-level firm activities (Kaplinsky & Morris 2001; Porter 2001). In contrast, the scope of this study includes and goes beyond the firm to include macro level perspectives of ecosystem services and global health as well as analysis of A2A interactions. Moreover, SDL offers more in-depth tools for analysis of interactions. Therefore, SDL was deemed more suitable for this study. Social network analysis (**SNA**) was also considered for the study. The SNA process involves using dedicated software which generates graphs and matrices to mathematically determine the strength of networks and clusters (Wasserman *et al.* 1994). SNA in addition to qualitative analysis is a useful approach for discerning how power structures within networks contribute to competitive advantage (Sloane & O'Reilly 2012). However, SNA is more applicable in existing networks with established communication. Thus, the

underdeveloped nature of the Swedish legume value chain poses issues for data collection and analysis.

3.1.5. Delimitations

The study focuses on Swedish actors that have a stake in the legume system. However, the study also includes actors that may not be currently acting in the system directly. It is considered that disengagement is equally as important as engagement and that the former indicates transaction costs or low potential for gains. Due to the underdevelopment of the Swedish legume system, it may be difficult acquiring information on potential challenges. The list of actors involved in the study are not an exhaustive list of stakeholders in the legume value chain. More candidates would be invaluable for analysis but has been limited due to time constraints. Fragmentation of farmers creates difficulties in reliable information collection that represents the group as a whole. Therefore, no individual farmers have been involved in the study. To compensate for this, networks that involve farmers are used as a proxy to gain better insight into their perspectives.

4. Empirical Background

This section contains the empirical research conducted on the legume value chain which places the problematisation of the Swedish system in context of other environmental, social, and economic factors.

4.1. Current outlook on the legume value chain

Globally and within the European Union (**EU**), legumes are cultivated on 16% and 10% of arable land respectively, while in comparison, approximately 2% of arable land is used in Sweden (see appendix 2, table A3; World Bank 2018; FAOstat 2020). More than 50% of total global legume production consists of soybeans used primarily for soybean oil and animal feed production (Watson *et al.* 2017; FAOstat 2020). Within Europe, the agricultural system has a crop protein deficit of approximately 70%, of which 87% of this demand deficit is met by soybean and soybean meal imports (Houdijk *et al.* 2013; Watson *et al.* 2017). Thus, there exists potential for development of a European value chain that meets food and feed demands. When considering the export industry, Canada the largest dried legume exporter, exported US$ 3.2 billion in dried legumes capturing 27% of the global legume export market in 2020 (OEC 2020).

The success of the Canadian legume value chain is attributed to several factors regarding climate, trade networks, investment and research which have the support of government bodies, private businesses, and non-government organisations such as Pulse Canada and Saskatchewan Pulse Growers. Public breeding programmes funded by public-private-producer collaborations between the University of Saskatchewan and the Crop Development Centre have resulted in seed varieties that suit the climate and soil in the Canadian Prairie provinces (Statcan 2015). In addition to agronomic research and development, investments in processing and distribution have contributed to market development (Knight 2000; Balázs *et al.* 2021). Since 1992, 300 primary processing facilities have been consolidated to larger and more efficient facilities located on main rail hubs (Knight 2000). Value added processing has also been a core strategy of the Canadian legume market to diversify the potential product portfolio and minimize risks associated with

fluctuations with feed exports (*ibid.*). Recently, Roquette Frères, a leading company in the starch industry, invested US$ 600 million in a pea processing facility which is estimated to process 125,000 tonnes of peas at maximum capacity (Edmiston 2021). Additionally, the Canadian Government (2021) invested C$ 4.3 million in legume system development by targeting transport networks and trade barriers with the goal of capturing 25% of new markets by 2025. Moreover, geographical access to ports for shipping to China, India and Turkey is cited as a competitive advantage (Statcan 2015). According to Knight (2000), the potential for significant value adding, government-initiated sustainability initiatives for on-farm benefits such as break cropping and weed and disease control in wheat-legume cropping systems is a key driver of the attractiveness of legume cultivation. For example, Saskatchewan Pulse Growers is led by a five-point strategic plan which includes but is not limited to, accounting for the effects of weed and disease impact, valorisation of nutritional benefits as well as farmer-oriented profitability and problem solving (SPG 2022).

In comparison to Canada, Sweden lacks similar infrastructure development and economic support. Currently, no processing facilities for boiling and packaging legumes exist locally and must be transported to Italy resulting in increased GHG emissions (Tidåker *et al.* 2021). Swedish producers face challenges of finding suitable crop varieties, investment, secure contracts, and extension services (Olsson 2017). Regarding environmental and agricultural policy, the Swedish parliament passed a passed a bill that sets a national target for net-zero emissions through sustainable consumption by 2045 (Swedish Parliament 2021). Additionally, organic certifications and the Swedish "Greening Support" initiative offer support for farmers and recently the CAP has begun considering support for legumes in 2023 (EC 2021; Swedish Board of Agriculture 2022a; 2022b).

When considering the feed market, Sweden imported approximately 240,000 tonnes of soybean meal cake which is estimated to equate to 140,000 ha of areal space (Swedish Board of Agriculture 2021). Meanwhile, in a transition scenario, Röös *et al.* (2020) evidence that replacing 50% of current meat consumption with plant-based protein requires 26,500 ha. The large required areal space for feed markets indicates that development of the feed sector is a significant factor in development of the legume value chain as a whole. Moreover, given that soybean meal cake is a by-product of oilseed extraction, the development of nutritionally balanced feed may also be linked to the promotion of local oilseed markets.

4.2. Environmental benefits of legumes

The main feature of legumes is their innate ability as nitrogen fixators to bind atmospheric nitrogen gas to ammonia in the soil through microbial enzymatic

processes. This process nourishes the legume crop itself and the next crop in rotation (Jensen *et al.* 2010). Leguminous crops therefore reduce the need for reliance upon synthetic fertilizers produced by energy intensive processes using fossil fuels, especially with the concern of peak oil and gas (Bentley 2002; Jensen *et al.* 2010). In addition, legumes in sole crop rotations improve soil health, phosphorus mobilisation and increase resilience against pests and weeds (Robson *et al.* 2002; Shen *et al.* 2011)

According to Crews and Peoples (2004; 2005), legume-based farming systems are likely to be more sustainable than synthetic fertilizer systems depending on region. Considering organic agriculture, global trends show a 550% increase in organic cropland to 29 Mha from 1999 to 2018 (Willer *et al.* 2020). However, evidence that organic systems can support the total world population is unclear. Organic systems produce less yields than intensive systems and 40% of the global population is dependent on synthetic fertilizers for sufficient food production (Smil 2004; Seufert *et al.* 2012). Thus, it is argued that organic N_2 fixation alone would not be able to meet current or future fertilizer demands and would thus result in increased deforestation for arable land (Sinclair & Cassman 1999; Smil 2004; Cassman *et al.* 2002). Crews and Peoples (2004) conclude that leguminous crop rotations should not seek to eliminate synthetic fertilizer, but to incorporate legumes in conventional agricultural rotations to gain from reduced fertilizer application and high yields. Field experiments show a reduction of 20-35 kg/ha N in applied fertilizer needed in legume-cereal rotations compared to cereal-cereal rotations with no effect on yields (Preissel *et al.* 2015). Similarly, other studies suggest that leguminous crops rather are not a panacea to solving issues in the nitrogen cycle, but one important part of a comprehensive strategy involving precision agriculture, food demand management and crop research (Crews & Peoples 2004; Poux & Aubert 2018; Röös *et al.* 2020).

Regarding food demand management, protein rich legumes play an integral role in transitioning to sustainable diets with lower proportions of animal sourced protein (Willet *et al.* 2019; Röös *et al.* 2020). Currently, 77% of global soy production is used to feed livestock and in Sweden, 80% of Swedish grown legumes are used as animal fodder (Röös 2020; Ritchie & Roser 2021). It is evidenced that 3.2 kg and 2.8 kg of human-edible food is used as animal fodder to produce 1 kg of monogastric and ruminant meat respectively, which raises the question of food-feed competition (Mottet *et al.* 2017). In contrast, studies show that consuming protein crops directly and reducing animal protein intake results in decreased arable land use, greenhouse gas emissions, N-surplus, P-surplus, freshwater use, non-renewable energy use and pesticide use intensity (Schader *et al.* 2015; Röös *et al.* 2020). Regarding other plant- and dairy-based protein alternatives, life cycle analysis of meat and soymeal-based, lab-grown, dairy-based, mycoprotein-based,

insect-based, and gluten-based meat alternatives shows that soymeal-based products have the lowest aggregate impact across 20 sustainability criteria per unit weight of ready to eat product (Smetana *et al.* 2015). Therefore, protein from legume sources is likely the most sustainable option for meeting future protein demands.

When considering animal feed, studies show advantages in replacing soybean-based animal feed with European legume varieties. Sasu-boakye *et al.* (2014) show a 15% reduction in GHG emissions from milk production where local legume varieties were fed to ruminants. Additionally, Baumgartner *et al.* (2008) show that out of five LCA case studies, three cases evidenced lowered use of non-renewable resources when soy was replaced with peas and fava beans due to the reduction of transport emissions and lowered energy requirements of cultivating peas and fava beans compared to soy.

4.3. Health aspects of legumes

Legumes are high in protein and a good source of carbohydrates, minerals, and vitamins. Legumes contain less protein than meat per 100 g serving but contain significantly more dietary fibre and less fat (see appendix, table A2). The high dietary fibre content of legumes results in a low glycemic index which is correlated to lowered incidence of cardiovascular disease and type 2 diabetes (Messina 2014; Clemente & Olias 2017). Moreover, there is strong evidence that the high potassium and magnesium content of legumes helps blood pressure management for individuals suffering from hypertension (Duman 2013). Research also shows lowered incidences of colorectal cancer in individuals that consume greater amounts of legumes (Wang *et al.* 2013; Zhu *et al.* 2015). In an EAT-Lancet commission, Willet *et al.* (2019) suggest a recommended daily intake of legumes from 50-100 grams in their *planetary diet*. This increased intake of legumes in conjunction with increased fruit, vegetable and nut consumption led to a reduction of 19% in premature mortality and 11.1 million avoided deaths per year in a global comparative risk assessment (Springmann *et al.* 2018). In comparison, Swedish consumption of legumes is significantly lower than the recommended intake at only 12 g (Swedish Food Agency 2012). Thus, evidence suggests that increased legume consumption within balanced diets can contribute to lowered incidence of non-communicable diseases, increased longevity, and reduced healthcare burden.

A problem associated with legumes is the presence of antinutritional factors such as enzyme inhibitors, lectins, oxalates, cyanogenic glycosides, and tannins (Sharma 2021). These substances are critical to plant growth and innate pest and disease resistance, however when consumed they inhibit the digestibility of certain

nutrients such as protein or bioavailability of minerals in both humans and animals (Gatel 1994; Abbas & Ahmad 2018). One option for reducing the concentration of antinutrients is through plant breeding and genotype selection, however this may have negative implications for plant yields (Khokhar & Apenten 2003; Sharma 2021). Thus, legumes need to be processed post-harvest in a way that reduces the concentration of these antinutritional compounds to avoid the risk of negative health effects in humans and as animal feed (Soetan & Oyewole 2009; Akande & Fabiyi 2010; Sharma 2021). Processing methods include dehulling, soaking, heat treatment, pressure extrusion, fermentation, and irradiation whereby the degree of antinutrient inactivation depends on processing method and legume type. Generally, household cooking techniques such as soaking and boiling reduce antinutrient concentrations to safe levels (Akande & Fabiyi 2010). In contrast to the negative aspects of antinutrients, other studies suggest potential health benefits of the same antinutrients which can have anticarcinogenic and antioxidant effects (Campos-Vega 2010; Sánchez-Chino 2015). More research is necessary for weighing the trade-offs between positive and negative effects of antinutritional factors of specific legume species and how they are respectively affected by different processing methods for human, ruminant and non-ruminant animal consumption.

4.4. Challenges of increasing legume production

A combination of economic, agronomic, policy, research and cultural factors constrain the expansion of legume production, processing, and consumption (Olsson 2017; Balázs *et al.* 2021; Röös *et al.* 2020; Röös *et al.* 2022). A summary of factors in the EU is presented in table 5 below. According to Olsson (2017), Swedish farmers and wholesalers express interest in expanding legume production. However, farmers are met with uncertainties regarding crop rotations, yields, lack of region adapted varieties, and weed and pest management (Zander *et al.* 2016, Olsson 2017). When considering alternative cropping methods that may solve weed and pest issues such as intercropping, farmers face the problem of inappropriate machinery for sorting and processing (Jensen *et al.* 2020). Development of legume seed varieties by breeders that are appropriate for the varied regions of Sweden are also lacking (Watson *et al.* 2017).

Table 5. Policy analysis of barriers for increasing legume production and consumption in the European Union (Adapted from Balázs et al. 2021)

Barriers and policy challenges	Description	Case study - country	Level
CAP/trade policies	- CAP's intense focus on production without sufficient support along the value-chain, no direct focus on legumes, and agroecological services undervalued by producers and society - Compartmentalization, lack of coherence and polarization of policies at EU level	Italy, Germany	National and EU level policy
N fertilizer policies	- Overuse/inefficient use of synthetic nitrogen, managing risk of leaching	Germany and Scotland	National and EU level policy
Research and development (breeding, processing)	- Challenges of breeding programmes (lack of state-financed programmes or private institutions, few investments in product development, lack of improvement and testing of local varieties)	Croatia, Scotland, Germany	National-level policy
Extension services/Profitability to farmers	- Difficulties of bridging regional supply and demand (decoupling from import in the feed sector, labelling food as regional, creating short food supply chains in the food sector) - Profitability is questioned by farmers (pest control, variable yields, not competitive with soybean, difficult to internalize external costs) as they are left without management tools and proper extension services - Proximity to processing facilities and trading companies	Scotland, Germany, Croatia, Italy	National-level policy
Consumers' preferences/Public procurements/dietary guidelines	- Public perception of pulses – not attractive enough - Lack of knowledge regarding the nutritional and health value of legume by consumers - Improved availability as convenience- or snack-foods, and access to information on cooking in easy-to-follow recipes	Denmark, Portugal, and Hungary	Voluntary and National level policy

In addition to agronomic issues, farmers have concerns for lack of economic viability due to large investments required for processing machinery and secure, long-term contracts (Olsson 2017). According to Zander *et al.* (2016), gross pea margins show a 25-78% variation making them a volatile and unattractive crop. Thus, expanding legume cultivation is a matter of increasing awareness and knowledge on the farm level and improving financial feasibility. Furthermore, profitability is inherently linked to consumption patterns and the ability of food processing companies to create and market attractive products. Therefore, strategies to increase legume production must take a macro perspective involving a range of different stakeholders from public and private organisations (Wigboldus *et al.* 2016).

Increasing consumption is deemed as the most important factor for solving the range of issues further up the legume value chain (Röös *et al.* 2020). Higher consumer demand would consequently mobilize financial capital for investment into machinery and research. Röös *et al.* (2020) suggest that processing and product innovation will be critical in making attractive and convenient products that reduce meat consumption as it is unlikely that consumers would significantly alter their behaviours to incorporate legumes in diets. Even with processing and innovation advancements, a study suggests that consumers remain sceptical about the taste and health attributes of legume-based products when compared to unprocessed legumes (Röös *et al.* 2022).

4.5. Local and global food supply chains

Since the Green Revolution post World War II, food supply chains have been increasingly globalized and industrialized (Clapp 2020). In 2018, global agricultural trade totalled at US$ 1.8 trillion, double the value of trade in 1995 (WTO 2019). Sweden is a large stakeholder in this global food market, importing 61% of its food in 2019 (SCB 2020). Global food systems enable the availability of affordable seasonal produce year-round by making use of favourable climates, arable land, and labour in other countries. Further in support of global systems, international food trade is shown as contributing to rural development by allowing countries to take advantage of natural resources and provide investment for increased employment, education, and infrastructure development leading to poverty reduction and improved food security (Scoones 1998; Dewi *et al.* 2001; Rist *et al.* 2010; Sibhatu 2019). In contrast, global systems have received criticism regarding food miles, a concept that uses distance travelled to evaluate the sustainability of foodstuffs (Paxton 1994). In critique of the food miles concept, research shows that the use of distance is misleading as transport from producer to retail only accounts for 4% of total greenhouse gas emissions and that the mode of

transport is the determinant factor in greenhouse gas emissions (Weber & Matthews 2008; Brunori *et al.* 2016). Other criticisms of global food supply chains include land grabbing, and environmental and social exploitation of weaker institutions that lack governance to produce cheap food for importing countries (McMichael 2012; Clark & Longo 2021; Washington Post 2022).

These criticisms of global systems push forward the food sovereignty movement, whereby local food systems are empowered through environmentally, socially, and economically sustainable practice based on policy which maintains the rights of producers and consumers as opposed to the current corporate food regime (Campesina 2007). Studies show that customers have an increased willingness to pay for local produce (Carpio & Isengildina-Massa 2009; Grebitus *et al.* 2013). Additionally, product price is inversely tied to consumption as a simulated meat and dairy tax in Sweden reduced greenhouse gas, nitrogen, phosphorus, and ammonia emissions by up to 12% due to demand mitigation (Säll & Gren 2015). However, this puts into question the food security status of more marginalized individuals that rely on the cheapest food products.

Other recent events such as COVID-19 and the 2022 Russian Invasion of Ukraine lead to global supply chain disruptions, record high shipping costs and increased fuel prices raises the issue of resiliency of global systems and increases interest in food security and protectionist policy afforded by more local systems (Hobbs 2020; BBC 2022; Bloomberg 2022; Freightos 2022). When considering protectionist policy after World War II, historical events suggest mixed sustainability outcomes. Subsidies and import tariffs in the American agricultural sector led to market power and cheap wheat exports which provided food aid but left certain countries dependent on imports (Clapp 2020). These sustainability trade-offs evidence the difficulties in evaluating global and local supply chains. Brunori *et al.* (2016), in a study assessing 24 sustainability criteria in 39 local and global food supply chains, conclude that caution should be used when comparing different spatial systems due to limitations in measurements, lack of concrete frameworks and complex trade-offs. Schmitt *et al.* (2017) come to a similar conclusion in their analysis of global and local products over five sustainability criteria.

Overall, when considering local or global networks, the perspective of the actor which is mediated by dynamic global events must be taken into consideration. Governments and policy makers may consider local systems beneficial due to food security and economic protectionist outcomes. Food production actors may weigh different factors such as price uncertainty of the global shipping market, prices of local and imported goods as well as brand identity. Customer demand will be mediated by educational institutions, socio-economic, and cultural backgrounds.

5. Results

This section presents the results of the five case studies combined with analysis from the perspective of SDL.

5.1. Axfoundation

Axfoundation is a non-profit organization that acts as an incubation tank for innovation within sustainable consumption and production. The business goal is to create sustainability solutions with long-term and systems perspectives. Axfoundation works with a variety of public and private actors within projects from circular fashion economies to sustainable rice cultivation in Pakistan. The business model of Axfoundation works by problematizing an issue and then connecting actors for knowledge and resource exchange. Once a project is finished incubating and commercially viable, Axfoundation takes a step back to allow other actors to drive the project. Axfoundation has ongoing and completed projects focused on legume systems. Currently, the organisation has a test farm and kitchen which experiments different legume varieties, cultivation, and cooking methods for economic and sensory viability. Previously, Axfoundation worked on a project to produce a legume-based meat alternative. The goal of the project was to create a product that satisfied customer needs and had high convenience factors. Thus, the aim was to create a minced meat alternative that fit into Swedish meal habits of tacos, bolognese and meatballs. Different combinations of legume varieties from the test farm were combined with a canola oil by-product and tested for sensory aspects within the test kitchen. Further customer testing was performed in schools to success as younger aged target markets were considered the most important. In addition to product development, scalability and viability of the legume varieties was tested in cooperation with four farms. Since the development of the product, the project has been taken over by entrepreneurs that launched the product commercially and one of the involved farms has changed to locally grown lupin as their animal fodder (pers. com. Axfoundation 2022).

5.1.1. Axfoundations perspective on constraining factors

According to the representative, the largest challenge for the legume system is the lack of processing infrastructure in Sweden. Thus, cultivated legumes can not be cleaned, peeled, and packaged or processed into other forms. In contrast, customers demand the convenience of pre-boiled legumes or other processed and ready-to-eat products. To solve this issue, investment within product development and processing infrastructure is seen as being integral to development of production and consumption (pers. com. Axfoundation 2022).

5.1.2. Analysis of Axfoundation

The network wide resource integration activities embody the concept of co-creation of value in the SDL framework. Customer needs for convenient and culturally relevant products was the basis for new product development of a legume-based meat alternative. Integrating this knowledge was mediated by Axfoundation to incorporate resources from different industries, agronomists, and entrepreneurs. This was refined through integration of customer operant resources in school age students. Ultimately, Axfoundations innovation development process allows for intra- and inter-firm resource integration with high transparency, credence, and sustainability values outside of the competitive market. These values contribute to non-competitive communication and efficient operation of SDLs service ecosystem constellations.

Regarding constraining factors, investment and processing infrastructure development are missing components of the legume service ecosystem which effect primary production and end-customer acceptance. This insight reflects the strategic need for systems thinking amongst actors for market development presented by SDL (Lusch *et al.* 2007; Karpen *et al.* 2012).

5.2. Local Legume Network (Lokala Baljväxtnätverket)

The Local Legume network (**LoBa**) is a cooperation between stakeholders in the Swedish legume system such as farmers, crop husbandry advisors, chefs, media influencers, policy makers, public organisations, consumers, retailers, processors, and wholesalers, including a participant in this study, Nordisk Råvara. The project began as a case study through DiverIMPACTS, an EU Horizon 2020 research and innovation programme, focused on increasing diversity in agriculture on field level. Thus, LoBa's core tenets are based on biodiversity, climate, nitrogen fixation,

resource use of farmland and health outcomes. The vision of the project is to make local legumes accessible and on every meal by 2028 through improving the profitability of cultivation, develop processing facilities, and increase consumption through campaigns and education. Moreover, the focus of LoBa is to create the best outcomes for the environment, society, through encouraging transparent collaboration (pers. com. LoBa 2022).

5.2.1. Interactions with other institutions and institutional logics

LoBa has received funding from the Country Administrative Board (Länsstyrelsen) and works among others with the regional Society for Nature Conservation (NSF, Naturskyddsföreningen) in Scania. In one project a food consultant from LoBa collaborated with NSF where representatives from NSF campaigned in food retail stores to inform consumers about legumes and recipes. In addition, the food consultant arranged a so called FoodJam where participants in the FoodJam got ingredients and recipes and, from that, prepared legume-based food such as bread, main meals and smoothies. Considering its success, FoodJam based on local legumes is a pedagogical tool that is intended to be developed further.

In another collaborative project, a member of LoBa received funding from FORMAS, the Swedish Research Council for Sustainable Development, to incorporate FoodJam into a tool to communicate about legume research. This project involves the creation of educational videos and real-time digital coaching to be presented in schools for students aged 13-19.

Overall, the network enables a dialogue for potential collaboration between actors. For farmers this means discussing issues of plant husbandry, sharing information and being able to connect to agronomists (pers. com. LoBa 2022).

5.2.2. Constraining factors in the network

According to LoBa, the largest challenge in the legume value chain is to balance production and consumption. Due to the price elasticity of demand for Swedish legumes, already a small surplus of produced volumes can lead to significant decreases in price which pose issues for primary producers. In addition, incentives and strategies surrounding innovation and entrepreneurship was cited as key factors in market development.

> "We've formulated guidelines for the network clarifying that you don't have to tell everything, but you have to share, that is a goal so that actors feel comfortable and that they have more to win that to lose" – LoBa representative.

Another constraining factor is cited as the push and pull between cooperation and competition, or 'coopetition (sic)', between different actors in the network. While actors want to invest and develop the value chain, they also want to avoid giving away competitive advantage. To combat this, the network has developed a framework to build trust in the network. This is pivotal for the network as all actors are needed as working parts for developing the chain (pers. com. LoBa 2022).

5.2.3. Analysis of LoBa

From the SDL perspective, the operations of LoBa takes a systems approach to the service ecosystem, whereby value co-creation is a foundation for interacting with primary producers, processors, retailers and policy makers for improved societal outcomes. Moreover, the LoBa differs from the conventional marketing theory of business development through its (1) core tenants rooted in sustainability and (2) framework for actors which enables cooperation. Firstly, LoBas beginnings as a research project have led to the core tenets of improving biodiversity, climate, nitrogen fixation, resource use of farmland and health outcomes. These goals are based on the different values it provides to macro-level stakeholders such as the environment and public health. Overall, the sustainability values and ethical standards create strong credence values thus enabling transparent exchange and long-term benefit. Secondly, LoBa leverages these sustainability goals and transparency to promote collaboration between actors of the network which otherwise consider each other as competition. From the SDL perspective, actors within the network become social relationship partners, with operant resources, that are able to contribute to system-wide solutions.

5.3. A New Recipe for School Meals

The New Recipe for School Meals (**NRSM**) project is a broad collaboration between schools, chefs, farmers, processors, the Swedish Food Agency (Livsmedelsverket), the Swedish Board of Agriculture (Jordbruksverket), the Swedish Public Health Authority (Folkhälsomyndigheten), the Swedish Environmental Protection Agency (Naturvårdsverket), the Procurement Authority (Upphandlingsmyndigheten), the Agency for Innovation Funding (Vinnova), the Swedish Agency for Youth and Civil Society (Myndigheten för Ungdoms- och

Civilsamhällesfrågor) and Sweden's municipalities and provinces. The project aim is to ensure that all children in Sweden have access to sustainable and good tasting school food that contributes to social, environmental, and economic sustainability to a greater extent than it does today. The project uses systems- and design thinking methods to identify challenges and develop solutions with sustainability as a core foundation. The project focuses on two of eight identified areas where changes are likely to have the greatest impact on the system. (1) To integrate school meals with the school curriculum as a learning tool and (2) to develop more sustainable school meals through a multi-stakeholder approach of creating a simplified procurement system. The project has a definition for what a sustainable school meal is, as defined by the Swedish Food Agency (appendix 1) which includes a diet with reduced meat and increased vegetables. Several prototype systems are being developed which involves a local tofu brand and fava bean producer (pers. com. NRSM 2022).

5.3.1. Integration of school meals with the curriculum

Through the project, one Swedish municipality has been cooperating with a tofu brand using an innovative programme called 'ExploreEAT' which targets students in 5th and 6th grade. The ExploreEAT concept uses the school meal as a way of introducing novel foods to students through interactive hands-on activities that are designed to appeal to the student's curiosity. For example, students are first introduced to the product through sensory games which involve smelling, tasting, and guessing what the products are. To complement this, pedagogical material is presented to the students which explains how the product is produced, where you can produce it, and how it can be produced it in a sustainable way. The students try the ingredient in three different dishes and vote on their favourite. In the last stage, the winning dish is served to all students at the school restaurant. In another initiative, a school farmers market attraction was established which featured farmers, dairy, and honey producers with the goal of connecting primary producers to schools. The farmers markets are set up on school grounds, simplifying the excursion organisation process. One stall featured a fava bean farmer and students were able to meet and talk to the producer as well as taste the produce. One product that was featured at the farmers market was a crisp made of fava beans that was received well by the students. The project has plans to quantitatively evaluate the efficacy of the pedagogical programmes for scaling up in the future (pers. com. NRSM 2022).

The two pedagogical programmes provide a service-focused approach to learning involving multiple actors which supports the SDL premise that "value is cocreated by multiple actors including the beneficiary". The interactive, experiential approach to knowledge transfer caters to the social school environment by integrating resources of firms and learning institutions. This bonding of the curriculum and

meal fundamentally changes the value proposition of the school meal. In comparison to the regular school meal, students are transformed from consumers to collaborators where a dialogue around food habits and environmental issues are created. In this sense, students are marketed *with* as opposed to marketed *to*. Consequently, students understand the societal and environmental context of food and are better able to take cocreate sustainability value.

From the perspective of the firm, the bidirectional channel enables feedback exchange and confers competitive advantage through product exposure, empowerment of sustainability ideology and building social communities through brand involvement. Moreover, the integration of products with the school systems presents a critical communication channel to firms, the firm-educational institution service exchange is fundamentally a micro-to-macro channel which alters the societal context of food and sustainability ideology. Therefore, both students and firms are able to gain from an improved service offering.

5.3.2. Streamlining the school meal procurement process

The second goal of NRSM, to create more sustainable school meals has proven to be difficult and has required challenging the existing systems of procurement. Purchasing of ingredients for school meals undergoes a stringent bureaucratic process at local and national levels between different authorities with long lead times. Moreover, current procurement contracts have lengths of up to four years which creates difficulties in changing suppliers. To solve this issue, NSRM currently work with two municipalities to simplify the regulative process and efficiently push procurement changes up the chain of command. The goal of the prototype system is to create a procurement policy framework that can be applied on a county and national scale to streamline changes in purchasing for school meals (pers. com. NRSM 2022).

From the SDL perspective, this simplified process facilitates enhancement of bureaucratic interactions to improve the current basis of resource integration. Actors are then able to engage their operand resources to contribute to the improvement of the value offering. In this case, the school meal procurement system is able to test novel products to improve learning outcomes and adapt to emergent narratives regarding healthy and sustainable meals, thus realizing the full economic, social and environmental benefit of resource integration. The streamlined procurement process improves service flows of the system so that resource integrators are more willing to collaborate, and beneficiaries gain from strengthened relationships and resource efficiency. However, this is mediated by the codes of conduct and values established by the engaged actors. Within SDL, this raises the question of what the service system assigns value to. Vargo and Lusch

(2012) argue that value is derived from the integration of resources in a specific context. In the NRSM case, the definition of a *sustainable school meal* creates the foundational context for the curriculum.

5.4. Nordisk Råvara

Nordisk Råvara is a business that processes and consolidates legumes, mainly for wholesale to processors and food service suppliers with a small portion of B2C sales through their online shop. CSR and credibility are core firm values. The vision of the firm is to produce a local, organic product of high quality and high traceability. Therefore, the firm collaborates only with farmers that share this vision and has a direct physical and ideological connection with the farmers. The firm guarantees purchase of harvests and has an agronomist dedicated to providing farm support services to optimise farm conditions. Nordisk Råvara focuses on Swedish heritage crops and currently has an assortment of 13 different legume varieties sourced form a network of 30 farms. The firm purchases the harvest and processes it further through cleaning and dehulling at small scale facilities which are spread out in local clusters. Within the Nordisk Råvara supply chain, achieving quality and refinement in the cleaning and sorting process is the prime challenge. To maintain a high-quality process, the firm uses optical scanning technology rather than rinsing with cleaning agents. Furthermore, scaling, financing, and adjusting this process for specific legume crops in time for reaching the market poses an issue. Expanding on-farm production itself not seen as an issue. However, when expanding production, bottleneck difficulties occur when matching yields with processing capacity. Regarding expanding legume production outside of the supply chain of Nordisk Råvara, the firm views it as unprofitable due to difficulties for independent actors in setting up processing facilities and finding contracts that secure purchase of crops (pers. com. Nordisk Råvara 2022).

Nordisk Råvara has seen significant growth in the last 5 years and according to the representative, the demand for plant protein is rapidly expanding, with more consumers becoming aware of the necessity to eat more plant rich diets. Moreover, food miles has become an important point of difference, current trends show that customers would like to purchase Swedish products due to chain strong chain governance and environmental aspects. To cater to customers, Nordisk Råvara is KRAV (see appendix 1) certified and work closely with their farmer network maintain best agricultural practices and traceability. All products are sourced locally within Sweden; however, the firm is not certified with the Från Sverige label (see appendix 1). Their product is attractively packaged in muted earth tones, and includes information about the product origin, agricultural methods, and farmers. The packaging is complemented by their website which explains their focus on

agricultural methods which promote soil health and nitrogen fixation. Moreover, a map features locations of the farms in Sweden as well as stories of the farms and history of the heritage legume species (pers. com. Nordisk Råvara 2022).

In addition to daily business operations, Nordisk Råvara has collaborated in an innovative plant material project focusing on the functional aspects of legumes. The project explored how different functional properties of different legume varieties could be combined to produce meat substitute products without the need for additional ingredients to ensure a product holds shape. The result of the research was a legume-based sausage that maintained form with only two legume ingredients. According to the representative, this confers significant competitive advantages in the form of building firm specific competency and increasing product attractiveness by eliminating the use of binding agents. In other research projects, the firm works with researchers in academia for growing new crops, testing different cultivation such as intercropping. Additionally, the firm collaborates with The Research Institute of Sweden and other academic institutions for climate calculations (pers. com. Nordisk Råvara 2022).

5.4.1. Analysis of Nordisk Råvara

To engage with actors on the farm level, Nordisk Råvara offers service approach which provides competence extension services, access to primary processing facilities and takes advantage of compensation offered by organic farming initiatives. This business model is a solution to the farm level challenges experienced by primary producers in the legume system. In the firm-farm dyadic exchange, this lowers transaction costs for primary producers entering the service ecosystem which enables the cocreation process. From the SDL perspective, the firm vision of offering a KRAV-certified, traceable, Swedish heritage product takes advantage of market trends to offering a value proposition that is attractive to the target market which has led to significant growth in the last 5 years. The aggregate sustainability attributes expressed in the product enable beneficiaries to realize the benefit of sustainability competences. This observed behaviour reflects the SDL premise that value cocreation is coordinated through actor-generated institutions and institutional arrangements. The functional properties research project provides further evidence that actor-institution cocreation can realize competitive advantage. The combination of multi-actor operant resources, although outside of the farming and wholesale operations of Nordisk Råvara, led to new firm competencies.

5.5. Stockeld Dreamery

Stockeld Dreamery is a start-up business that produces plant-based dairy alternatives that has recently received funding of US$ 20 million. The first product released by the firm, the 'Chunk' is a feta cheese alternative produced with fava beans, yellow peas and coconut oil which undergo a fermentation process to achieve a flavour and texture similar to dairy-based feta cheese. According to the representative, plant-based cheeses account for approximately 0.1% of the cheese market while in comparison plant-based milk alternatives have a much larger market share (Good Food Institute 2021; pers. com. Stockeld 2022). The firm's perspective is that low market shares of plant-based cheeses is due to their inability to compete on price, taste and convenience with dairy-based cheese. The Chunk contains 13% protein and 20% fat which is comparable to regular feta cheese whereas the leading plant-based competitor however has 0% protein and 30% fat content. Moreover, the Chunk has approximately 80% lower emissions impact compared to conventional feta cheese (pers. com. Stockeld 2022).

The start-up has an inhouse research team which has developed the product from the ground up and currently other plant-based dairy alternatives such as a cream cheese and melting cheese are underway. Currently, Stockeld Dreamery sources its base ingredients globally, produces with a production partner Emå Dairy in southern Sweden for sale in Sweden. The firm has been unable to secure a supplier of legumes grown in Sweden due to factors such as price, quality and volume. Stockeld Dreamery has plans to expand sales to the rest of Europe and America. Marketing strategy for the Chunk is heavily focused on flavour, appearance and experience with a secondary focus on the sustainability aspects. From their perspective, taste doesn't have to come at the cost of a better conscience. In addition to sensory aspects, transparency is a core focus, with carbon emissions and procurement practices to be listed on the website (pers. com. Stockeld 2022).

5.5.1. Interactions with other institutions and institutional logics

Stockeld Dreamery has strong interaction with consumer groups. Product development has incorporated feedback from over 40 chefs and blind consumer tests have been used to evaluate their products as part of research. The Chunk has been benchmarked against their competitors to see how it scores on various factors such as appearance and taste. Looking at more market-facing interactions, Stockeld Dreamery has collaborated with local cafes and restaurants where the Chunk is used as a part of their dishes where it is a temporary menu options or becomes a long-term partnership. These collaborations have been effective in communicating with food service actors to understand how the sensory properties of the product contribute to a dish and could be improved upon. Moreover, Stockeld Dreamery is

a member of trade organisations such as Plant-Based Sweden (Växtbaserat Sverige). In addition, the firm has had contact with various members of the EU and Swedish parliament regarding how food system subsidies promote animal-based products rather than plant-based.

Other than purchasing through wholesalers, the firm has little interaction on farm level. According to the representative, there is a disconnect between farmers and retailers and processors. Since the farmer has already met their contractual obligation, they care less about speaking to brands and consumers.

In addition to its inhouse team of researchers, Stockeld Dreamery has interactions with the academic sector for implementing life cycle analysis or developing new processes and technologies for innovation.

5.5.2. Analysis of Stockeld Dreamery

The service ecosystem in the Stockeld Dreamery case presents a range of complicated interactions between different actors in the value chain. Within the dyadic exchange between customers, the goal of the business is to enter an underdeveloped market with innovative products that cater to customers' demands for a plant-based cheese that has comparable sensory and nutritional qualities to dairy-based cheese. Secondly, collaborations with restaurants and customers allow the firm to understand how the product is used in reality, as this can differ from its design intention. From a service perspective, this creates a bidirectional information flow which facilitates iterative service improvement. Thirdly, collaborations with other firms for life cycle analysis to adhere to ethical standards engages beneficiary operant resources thereby cocreating the benefits of good environmental practice to influence the willingness to pay. Interestingly, although the Chunk is a significantly more sustainable alternative to dairy-based cheese, the marketing strategy focuses on building a narrative of sensory experience. This strategy is based on a service-centric theory that sensory aspects appeal more to the brands target audience in comparison to sustainability aspects citing inconsistencies with studied and observed consumer behaviour. Based on the interview data, the value of sustainability in competitor products has not been able to be taken advantage of by customer operant resources due to poor taste quality.

Policy level engagements with the intent to increase institutional equality between animal- and plant-based products is a strategic manoeuvre to strengthen the cocreation process within the entirety of the plant-based ecosystem. The service ecosystem potentially receives benefits in terms of more efficient information flows or reduced operational costs through eased regulations or direct subsidies.

Lack of farm level engagements indicate a potential weak link in the service ecosystem. From the perspective of SDL, farmers and processors do not cocreate value or share operant resources beyond the direct exchange of goods. Due to the lack of bidirectional communication channels, actors encounter difficulties to determine the context of business operations for mutual service betterment. Moreover, gaps in actor linkages indicate potential issues for strong transparency and credence values in supply chains without appropriate certification systems. In contrast, greater engagement on farm level could lead to stronger service ecosystems, investment, and development of the Swedish legume system. However, the competitive advantage of this is also linked to how the value proposition of local food is perceived at macro, meso and micro levels. Moreover, when considering differences industry structures, primary producers may be many and fragmented which may lead to difficulties in communication and goal setting. Thus, according to SDL, strong institutional logics may be necessary to organize networks of farmers.

5.6. Actor perspectives on changes to the CAP

All actors involved in the study were unaware of the potential tentative changes to the CAP to support legume cultivation on the EU-level. As observed in this study, interactions with policy makers were limited to the Swedish national level to varying degrees. Per SDL, this indicates a disconnect in the service ecosystem which is necessary to bridge to valorise the total social and environmental outcomes provisioned by legume cultivation and consumption.

6. Discussion

This chapter discusses the empirical background, results, and analysis of the study in light of other scientific literature and the three research questions which are: (1) How do different actors understand the function of legumes for environmental, social, and economic outcomes? (2) How do actors collaborate with other actors to overcome issues in the value chain? (3) What changes are necessary to stimulate development of the legume value chain?

6.1. Actor understanding of legume functionality

Ultimately, the decision to act within the legume service ecosystem is based on a combination of sustainability ideology and economic potential for new market trends. The five actors participating in this study appreciate and utilise the functional aspects of legumes for environmental, social, and economic purposes.

6.1.1. Do global and local systems influence actor behaviour?

As discussed in section 4.5, local and global food systems confer complex trade-offs. Within the legume ecosystem, the relevance of spatiality depends on factors such as the increased international shipping cost of ingredients (Freightos 2022), trade tariffs (Hitchner *et al.* 2019), food safety concerns (Hobbs 2020; Marti *et al.* 2021), and public appreciation of local food and how locality can be marketed by processors (Hobbs 2020; Gruvaeus & Dahlin 2021). For Nordisk Råvara and NRSM, locality is a key product attribute that is marketed to customers. On the other hand, the origin of ingredients is a less significant marketing factor for Stockeld Dreamery. While Stockeld Dreamery is willing to collaborate and develop products using Swedish legumes, price and quality is a determinant factor. Given the complexity of trade-offs in spatiality, it is difficult to draw normative conclusions of the total sustainability outcomes. Policy makers and marketers must consider current trends, events, and target markets.

When considering price, higher priced, organic, and local legume products may deliver strong sustainability outcomes for customers with the ability and willingness to pay. Conversely, lower priced legume products sourced

internationally may be less sustainable than their local and organic counterparts but be able to capture a larger share of the market and still confer high sustainability outcomes. For example, replacing local meat with internationally sourced plant-based proteins is significantly more sustainable as land use factors play a larger role than shipping distance in life-cycle analyses (Weber & Matthews 2008). 1 kilogram of organic Swedish beef releases 21.7 kg of carbon dioxide equivalents (**CO_2-eq**) of greenhouse gases compared to 0.3 kg CO_2-eq for 1 kg of conventionally grown lentils from Canada transported to Sweden purchased dry and cooked at home (Cederberg & Nilsson 2004; Tidåker *et al.* 2021). However, a price sensitive customer likely already purchases legumes due to their higher comparative price of meat. For customers already habitually consuming legumes, locality of competing legume products may be a determinant factor in influencing purchasing decisions. Therefore, culturally relevant legume varieties such as Gotlandslentils pose an opportunity for firms to market locality.

In addition to price, cultural factors should also be considered with respect to product attributes. For example, felafel which is traditionally made with chickpeas may be less accepted by certain individuals even if local legumes can be used to create felafel with similar or better sensory aspects (Janhager 2020). For nutritional claims, Lemken *et al.* (2017) show that customers have a greater willingness to pay for legume-flour based pasta labelled as high in protein. The inherent protein content and other potential benefits of legumes should be explored by firms. However, the perception of protein content may differ for legume-based meat and dairy alternatives as meat and dairy already have high protein content.

6.1.2. Implications for marketers

Legumes can be processed on a scale from lightly processed as dried, boiled, and ready to eat, moderately processed as tofu or plant-based sausages bound by natural functional properties or very highly processed in the form of meat and dairy substitutes based on protein isolates and synthetic binding agents. This study offers perspectives on how market-facing actors perceive the attributes of their customers, products and some strategies used to promote to them.

For marketers, it is important to consider the difference between legumes and legume-based meat and dairy alternatives (**LBA**). Marketing strategies for legumes and LBAs may differ significantly due to differences in target markets and product attributes. Röös *et al.* (2022) show that customers are sceptical of the health, environmental and sensory aspects of LBAs. According to Bohrer (2019), very highly processed meat analogues fit under the ultra-processed product category. While plain boiled legumes are perceived as being healthy and environmentally friendly, barriers to consumption exist in the form of convenience and lack of

knowledge of preparation techniques (Röös *et al.* 2022). LBAs with a lower degree of processing such as through Nordisk Råvara's functional protein project or Färsodlarna may be more attractive to customers (Färsodlarna n.d.). However, informing customers on this process in an accessible way may pose a challenge for firms.

Currently, firms are solving the sensory issues of LBAs through technological innovation. Logically, unless innovative products are able to entirely match the sensory aspects of meat and dairy products, the value proposition of legumes and LBAs is determinant on cultural and sociological factors. Thus, if sensory parity can not be met, firms should engage in sustainability marketing to convey the environmental and social propositions of their products. The implication from SDL is that the service offered by public and private institutions to mediate sustainability practically and ideologically is an important resource for market-facing actors that seek competitive advantage. Ultimately, sustainability marketing is an ethical and socioemotional issue which can be mediated. Customers that believe that their behaviour has significant impacts on environmental and social issues are more likely to make sustainable purchasing decisions (Antonetti & Maklan 2014). A consequence for actors is that CSR factors such as transparency, accountability, and communication become core elements of building sustainability credence values. From the SDL perspective, strong integrated service ecosystems occur when resource integrators are social relationship partners. In the context of this study, this is interpreted as having bidirectional communication channels along the value chain. In practice, we observe that Nordisk Råvara and Stockeld Dreamery currently or plan to offer traceability and lifecycle calculations for their products. Thus, the value proposition is mediated by the beneficiary's appreciation of sustainability.

6.2. The legume service ecosystem – factors for development

The legume value chain consists of a complex and dynamic interaction with food, feed, research, innovation, public and private institutions, environmental and health systems. A list of stakeholders is presented in section 2.4, figure 6. According to SDL, service exchange coordinated by actor-generated institutions and institutional arrangements are necessary for value cocreation. In the case of the Canadian legume market, environmental and economic value has been attributed to legumes resulting in research, investment, and infrastructure and trade policy development. Moreover, this progress has been led by large cooperatives and government initiatives. This confirms findings by Zander *et al.* (2016) and Balázs *et al.* (2021)

which indicate the need for acknowledging the environmental and health benefits and translating them into economic terms.

In comparison, some agricultural policy has been created to support farmers in Europe, but the efficacy of such policy is uncertain. The necessity of these multiple levels in the legume system embodies the SDL concept of the service ecosystem where there is a strong focus on collaboration for cocreation. Within the SDL framework, coordinated collaboration should occur at multiple levels, for example in the direct value chain and supporting institutional logics. This is highlighted by the price elasticity concerns expressed by LoBa, where increased supply without increased demand would lead to price declines for primary producers. Evidently, farm-level initiatives must be supported by holistic strategies for improving legume processing and consumption.

6.2.1. Systems for innovation and collaboration

The issue of "coopetition" is cited by LoBa as a constraining factor for system development. The implication being that economic factors and competitive advantage create unfavourable conditions for new market growth. In another study of the Swedish legume system, it is shown that it is mainly economic factors that drive interest in developing the legume market with sustainability factors being secondary (Olsson 2017).

When considering sustainability initiatives that target the macro level of influencing consumer knowledge, private actors may be reluctant to spend resources on campaigns that also increase the sustainability credibility of the total market and their competitors. This economic reasoning follows Porters (2008) five competitive forces, where the sustainability efforts of a firm may encourage new entrants and threat of substitutes. In contrast, Porter and Kramer (2011) argue that constrained suppliers are less able to deliver on quality products and innovate such as in the case of low legume prices for farmers and unsecure contracts (Zander *et al.* 2016; Olsson 2017). Moreover, Porter and Kramer (2011) propose the concept of *shared value*, a business practice of generating competitive advantage whilst promoting environmental and social outcomes. The shared value concept bares similarity to SDL's value cocreation concept whereby resource integrating actors are social relationship partners (Karpen *et al.* 2012). According to Porter and Kramer (2011), shared value increases efficiency, product quality, sustainability and encourages trust and long-term collaboration leading to total market growth. Importantly, shared value and cocreation of value combines concepts of profit and non-profit and is easier said than done in a competitive and conventional business environment. Thus, publicly funded organisations and non-profits such as LoBa, NRSM, and Axfoundation are critical in developing transparent strategies which

can be wholly endorsed by customers and firms. In the case of the Canadian legume system, actor networks such as Canada Pulse, Alberta Pulse Growers, and Saskatchewan Pulse Growers have played a significant role in market development. Currently, the efficacy of strategies applied by LoBa and NRSM are difficult to determine due to the infancy of their programs.

6.3. Valorising legumes and implications for policy development

Valorising the potential environmental and social impacts of legumes is necessary to increase the economic viability of legumes (Zander et al. 2016; Balázs et al. 2021). Organic systems encourage the use of natural sources of fertilizer such as manure or nitrogen fixation and offer certification and compensation (Swedish Board of Agriculture 2022c; KRAV 2022). However, there is no direct support within conventional agriculture. In addition to farm-level impacts, stakeholders within healthcare should consider the potential of legumes for positive long-term outcomes. The complex balance between firm outcomes of environmental, social, and economic outcomes indicates that policy level strategies for realisation of environmental and social benefits may stimulate growth of sustainability entrepreneurship beyond the farm level. This parallels the conclusion that no single policy amendment would significantly change the outlook for the legume value chain (Geels *et al.* 2015; Smith *et al.* 2016; Balázs *et al.* 2021). Historically, policy for direct legume price supports in 1974, 1978 and 1989 have not increased areal production of legumes in the EU (Watson *et al.* 2017:27). This is in agreement with the perspectives of actors involved in this study. Rather than direct support, policy should support long term development and sustainable business models. Relevant policies may exist in the form of a carbon tax which encourages decarbonisation strategies and reduction of synthetic fertilizer use (Metcalf & Wiesbach 2009). Zander *et al.* (2016) suggest policy to limit imports of internationally sourced soybean to promote local markets. In 2018, taxation on sugar in the carbonated drinks industry in the United Kingdom resulted in 50% of manufacturers reformulating recipes to reduce sugar content (UK GOV 2018). Moreover, Säll and Gren (2015) evidence the efficacy of a meat and dairy tax on consumption, however an interesting avenue for research is how such a tax may encourage growth of alternative protein industries. Negative reinforcement strategies such as taxation may incentivize larger existing actors to diversify product strategies whereas positive reinforcement such as a grants for targeted research areas may encourage entrepreneurship and new market entrants. In contrast, without these policy-based systems, the effects of good environmental and social practice are mostly realised

through CSR benefits that may be more difficult to quantify and thus more difficult for firms to justify.

The necessity of policy development raises the question, how should actors organise to create comprehensive policy development to stimulate legume cultivation, processing, and consumption? As observed in this study, actors have limited interaction with EU-level policy and varying levels of engagement with national level policy and public institutions. Given the systems nature of potential impacts, multi-stakeholder collaborations are necessary to develop comprehensive economic, regulatory, and social instruments that balance production and consumption. Institutional logics such as LoBa for example, should be structured accordingly. A list of relevant actors is provided in section 2.4, figure 6. Actions from Stockeld Dreamery to alert policy makers on uneven policy development between plant-based and animal systems suggests that competitive advantage can mean assisting whole value chains for system equality. Policy then becomes not only an institutional logic that firms must adhere to, but also a system that can be influenced by bringing attention to environmental, social, and economic issues. A consequence could be evening the competitive regulatory playing field or ratcheting up standards to deter competition. This reflects SDLs premise of co-creating value, whereby firms and policy makers share operant resources for mutual benefit. SDL, being a theory of markets and firm behaviour does not offer hard and fast rules on what specifically should be done but provides a framework for how actors should approach relationships for mutual betterment and high credence values. Moreover, this study only provides a surface level explanation of policy interactions. Thus, the exact nature of how integrated policy should be developed is an avenue for future research. In this regard, one perspective that SDL provides is that of defining value as presented in table 3. For legume system stakeholders, concretely defining value will enable valorisation and long-term goal setting. This is also reflected in the values and goals of the participants within this study.

6.4. Contributions, limitations, and future research

Several studies explain the environmental and social potential of legumes but there is a lack of studies focused on market activities and actor perspectives. The main contribution of this study is filling this research gap by offering insights into how actors strategically interact within the Swedish legume value chain. Analysis of this data shows how intra- and inter-firm activities lead to product innovation and development of networks and policy change. Importantly, transparent CSR-oriented approaches which incorporate strong social and environmental values is a common theme amongst the studied actors. These insights can contribute to the strategy of policy makers, non-government organizations, customer associations

and marketers. Moreover, this study contributes to the evolving narrative of SDL literature by applying the framework within a sustainability context. SDL offers a perspective of markets for co-creation of value through mutual A2A relationship building highlighting the need for transparent systems. Moreover, the role of the beneficiary in integrating sustainability knowledge indicates the importance of education systems and marketing campaigns. However, this study presents a snapshot of activities and perspectives of a limited number of actors within the legume ecosystem and does not capture the dynamism of the system in its' entirety (Ericksen 2008). As part of this snapshot, this study uses a network of actors which involves farmers as a proxy to gain some perspectives of farmers. This was done because the fragmentation of farmers poses difficulties in obtaining reliable and generalizable data that represents the group as a whole.

Ultimately, the Swedish legume system is mediated by global systems of policy, trade, climate occurrences and market trends which effects the sociotechnical regime. Thus, I consider comprehensive analysis of environmental, social, and economic trade-offs and service valorization for policy development at national and EU-levels the most pressing matter for future research. Moreover, firms, education, and healthcare stakeholders should consider the nuances of marketing different legume-based products based on these policy developments, market trends, and different product categories.

7. Conclusions

This study explains how market-facing, public and private actors with varying roles engage in the legume service ecosystem to overcome the lack of physical, political, and societal infrastructure in Sweden. Overall, actors involved in the study understand the environmental, social, and economic potential of legumes and show strong collaborative competencies for innovation, marketing, and some national level policy interactions. However, stronger EU-level policy interactions are needed. Moreover, customer knowledge needs development for improving customer operant resources so that value propositions can be fully understood. Marketers should consider the different product attributes of different legume varieties and legume-based meat and dairy alternatives when developing marketing strategy. The SDL framework suggests that coordinated multi-stakeholder collaboration within overlapping institutional logics is integral for comprehensive development of firm strategy, national and EU-level policy for valorising the environmental and social impacts of legume production and consumption for improving farm level viability and customer acceptance.

References

Abbas, Y. & Ahmad, A. (2018). Impact of Processing on Nutritional and Antinutritional Factors of Legumes: A Review. 19 (2), 17

Abela, A.V. & Murphy, P.E. (2008). Marketing with integrity: ethics and the service-dominant logic for marketing. *Journal of the Academy of Marketing Science*, 36 (1), 39–53. https://doi.org/10.1007/s11747-007-0062-0

Akaka, M., Vargo, S. & Lusch, R. (2013). The Complexity of Context: A Service Ecosystems Approach for International Marketing. *Journal of International Marketing*, 21. https://doi.org/10.1509/jim.13.0032

Akande, K. & Fabiyi, E.F. (2010). Effect of Processing Methods on Some Antinutritional Factors in Legume Seeds for Poultry Feeding. *International Journal of Poultry Science*, 9. https://doi.org/10.3923/ijps.2010.996.1001

Antonetti, P. & Maklan, S. (2014). Feelings that Make a Difference: How Guilt and Pride Convince Consumers of the Effectiveness of Sustainable Consumption Choices. *Journal of Business Ethics*, 124 (1), 117–134. https://doi.org/10.1007/s10551-013-1841-9

Axfoundation. (n.d.). *Svensk Baljväxtfärs - från böna till färdig produkt*. https://www.axfoundation.se/projekt/svensk-baljvaxtfars [2022-01-25]

Bajželj, B., Richards, K.S., Allwood, J.M., Smith, P., Dennis, J.S., Curmi, E. & Gilligan, C.A. (2014). Importance of food-demand management for climate mitigation. *Nature Climate Change*, 4 (10), 924–929. https://doi.org/10.1038/nclimate2353

Balázs, B., Kelemen, E., Centofanti, T., Vasconcelos, M.W. & Iannetta, P.P.M. (2021). Integrated policy analysis to identify transformation paths to more sustainable legume-based food and feed value-chains in Europe. *Agroecology and Sustainable Food Systems*, 45 (6), 931–953. https://doi.org/10.1080/21683565.2021.1884165

Baumgartner, D., de Baan, L., Nemecek, T., Pressenda, F., Crépon, K., Cottril, B., Busquet, M., Montes, M., Cechura, L., Davis, J. & Sonesson, U. (2008). European grain legumes - environmental friendly animal feed? *Grain Legumes*, 50, 17–20

BBC (2022) *Ukraine conflict: Petrol at fresh record as oil and gas prices soar*. https://www.bbc.com/news/business-60642786 [2022-03-25]

Bentley, R.W. (2002). Global oil & gas depletion: an overview. *Energy Policy*, 30 (3), 189–205. https://doi.org/10.1016/S0301-4215(01)00144-6

Bloomberg. (2022). *Container Ship Rates Set to Rise on More China Covid Lockdowns.* https://www.bloomberg.com/news/articles/2022-03-14/container-freight-rates-set-to-rise-on-more-china-lockdowns [2022-03-25]

Bohrer, B.M. (2019). An investigation of the formulation and nutritional composition of modern meat analogue products. *Food Science and Human Wellness*, 8 (4), 320–329. https://doi.org/10.1016/j.fshw.2019.11.006

Brunori, G., Galli, F., Barjolle, D., Van Broekhuizen, R., Colombo, L., Giampietro, M., Kirwan, J., Lang, T., Mathijs, E., Maye, D., De Roest, K., Rougoor, C., Schwarz, J., Schmitt, E., Smith, J., Stojanovic, Z., Tisenkopfs, T. & Touzard, J.-M. (2016). Are Local Food Chains More Sustainable than Global Food Chains? Considerations for Assessment. *Sustainability*, 8 (5), 449. https://doi.org/10.3390/su8050449

Bärta. (n.d.). *Hem*. https://swedishtemptations.com [2022-01-25]

Campesina, V. (2007). Nyéléni declaration. In *Sélingué, Mali: World Forum on Food Sovereignty. Reorienting Local and Global Food Systems Marcia Ishii-Eiteman* (Vol. 235).

Campos-Vega, R., Loarca-Piña, G. & Oomah, B.D. (2010). Minor components of pulses and their potential impact on human health. *Food Research International*, 43 (2), 461–482. https://doi.org/10.1016/j.foodres.2009.09.004

Canadian Government. (2021). *Government of Canada helps meet global demand for sustainable protein products*. [news releases]. https://www.canada.ca/en/agriculture-agri-food/news/2021/11/government-of-canada-helps-meet-global-demand-for-sustainable-protein-products.html [2022-04-05]

Carpio, C.E. & Isengildina-Massa, O. (2009). Consumer willingness to pay for locally grown products: the case of South Carolina. *Agribusiness*, 25 (3), 412–426. https://doi.org/10.1002/agr.20210

Cassman, K.G., Dobermann, A.R. & Walters, D.T. (2002). Agroecosystems, Nitrogen-use Efficiency, and Nitrogen Management. 31 (2), 10

Cederberg, C. & Nilsson, B. (2004). Livscykelanalys (LCA) av ekologisk nötköttsproduktion i ranchdrift (LCA of organic beef in a free-range system). SIK-rapport 718, Institutet för Livsmedel och Bioteknik, Göteborg. ISBN 91-7290-230-0.

Clapp, J. (2020). *Food*. John Wiley & Sons.

Clark, T.P. & Longo, S.B. (2021). Global labor value chains, commodification, and the socioecological structure of severe exploitation. A case study of the Thai seafood sector. *The Journal of Peasant Studies*, 0 (0), 1–25. https://doi.org/10.1080/03066150.2021.1890041

Clemente, A. & Olias, R. (2017). Beneficial effects of legumes in gut health. *Current Opinion in Food Science*, 14, 32–36. https://doi.org/10.1016/j.cofs.2017.01.005

Crews, T.E. & Peoples, M.B. (2004). Legume versus fertilizer sources of nitrogen: ecological tradeoffs and human needs. *Agriculture, Ecosystems & Environment*, 102 (3), 279–297. https://doi.org/10.1016/j.agee.2003.09.018

Crews, T.E. & Peoples, M.B. (2005). Can the Synchrony of Nitrogen Supply and Crop Demand be Improved in Legume and Fertilizer-based Agroecosystems? A Review. *Nutrient Cycling in Agroecosystems*, 72 (2), 101–120. https://doi.org/10.1007/s10705-004-6480-1

Dagligvarunytt. (2022). *Premiär för svensk proteinfabrik: ”Ligger helt rätt i tiden”* https://www.dagligvarunytt.se/marknadsnytt/innovation/premiar-for-svensk-proteinfabrik-ligger-helt-ratt-i-tiden/ [2022-01-25]

Dewi, S., Belcher, B. & Puntodewo, A. (2005). Village economic opportunity, forest dependence, and rural livelihoods in East Kalimantan, Indonesia. *World Development*, 33 (9), 1419–1434. https://doi.org/10.1016/j.worlddev.2004.10.006

Díaz-Méndez, M., Paredes, M.R. & Saren, M. (2019). Improving Society by Improving Education through Service-Dominant Logic: Reframing the Role of Students in Higher Education. *Sustainability*, 11 (19), 5292. https://doi.org/10.3390/su11195292
Duman, S. (2013). Rational approaches to the treatment of hypertension: diet. *Kidney International Supplements*, 3 (4), 343–345. https://doi.org/10.1038/kisup.2013.73
Edmiston, J. (2021). Why processing beans, peas and lentils could solve Canada's "commodity conundrum." *Financial Post*. https://financialpost.com/news/economy/processing [2022-04-04]
Ericksen, P.J. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change*, 18 (1), 234–245. https://doi.org/10.1016/j.gloenvcha.2007.09.002
FAOstat. (2018). *FAOSTAT - database*. https://www.fao.org/faostat/en/#home [2022-04-04]
Färsodlarna (2021). https://farsodlarna.se/ [2022-05-02]
Ferawati, F., Hefni, M. & Witthöft, C. (2019). Flours from Swedish pulses: Effects of treatment on functional properties and nutrient content. *Food Science & Nutrition*, 7 (12), 4116–4126. https://doi.org/10.1002/fsn3.1280
Ferawati, F., Zahari, I., Barman, M., Hefni, M., Ahlström, C., Witthöft, C. & Östbring, K. (2021). High-Moisture Meat Analogues Produced from Yellow Pea and Faba Bean Protein Isolates/Concentrate: Effect of Raw Material Composition and Extrusion Parameters on Texture Properties. *Foods*, 10 (4), 843. https://doi.org/10.3390/foods10040843
Font, X., English, R., Gkritzali, A. & Tian, W. (Stella) (2021). Value co-creation in sustainable tourism: A service-dominant logic approach. *Tourism Management*, 82, 104200. https://doi.org/10.1016/j.tourman.2020.104200
Freightos. (2022). *Freightos Baltic Container Freight Index (FBX)* (n.d.). https://fbx.freightos.com [2022-03-25]
From Sweden (Från Sverige). (n.d.) *Svenska Råvaror*. https://fransverige.se/ [2022-04-13]
Gatel, F. (1994). Protein quality of legume seeds for non-ruminant animals: a literature review. *Animal Feed Science and Technology*, 45 (3), 317–348. https://doi.org/10.1016/0377-8401(94)90036-1
Geels, F.W., McMeekin, A., Mylan, J. & Southerton, D. (2015). A critical appraisal of Sustainable Consumption and Production research: The reformist, revolutionary and reconfiguration positions. *Global Environmental Change*, 34, 1–12. https://doi.org/10.1016/j.gloenvcha.2015.04.013
Good Food Institute. (2021). *Retail sales data: Plant-based meat, eggs, dairy*. https://gfi.org/marketresearch/ [2022-05-26]
Government of Canada, S.C. (2014). *Pulses in Canada*. https://www150.statcan.gc.ca/n1/pub/96-325-x/2014001/article/14041-eng.htm#a6 [2022-04-04]
Grebitus, C., Lusk, J.L. & Nayga, R.M. (2013). Effect of distance of transportation on willingness to pay for food. *Ecological Economics*, 88, 67–75. https://doi.org/10.1016/j.ecolecon.2013.01.006
Grönroos, C. & Gummerus, J. (2014). The service revolution and its marketing implications: service logic vs service-dominant logic. *Managing Service Quality*, 24 (3), 206–229. https://doi.org/10.1108/MSQ-03-2014-0042

Gruvaeus, A. & Dahlin, J. (2021). Revitalization of Food in Sweden—A Closer Look at the REKO Network. *Sustainability*, 13 (18), 10471. https://doi.org/10.3390/su131810471
Hitchner, J., Menzie, K. & Meyer, S. (2019). Tariff Impacts on Global Soybean Trade Patterns and U.S. Planting Decisions. *Choices*, 34 (4), 1–9
Hobbs, J.E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, 68 (2), 171–176. https://doi.org/10.1111/cjag.12237
Janhager, J. (2020). *Suitability of different pulses in falafel making – a new application for Swedish foods.* Second cycle, A2E. Uppsala: SLU, Department of Molecular Sciences
Jensen, E.S., Carlsson, G. & Hauggaard-Nielsen, H. (2020). Intercropping of grain legumes and cereals improves the use of soil N resources and reduces the requirement for synthetic fertilizer N: A global-scale analysis. *Agronomy for Sustainable Development*, 40 (1), 5. https://doi.org/10.1007/s13593-020-0607-x
Jensen, E.S., Peoples, M.B. & Hauggaard-Nielsen, H. (2010). Faba bean in cropping systems. *Field Crops Research*, 115 (3), 203–216. https://doi.org/10.1016/j.fcr.2009.10.008
Kaplinsky, R. & Morris, M. (2001). A Handbook for Value Chain Research. 113
Karpen, I.O., Bove, L.L. & Lukas, B.A. (2012a). Linking Service-Dominant Logic and Strategic Business Practice: A Conceptual Model of a Service-Dominant Orientation. *Journal of Service Research*, 15 (1), 21–38. https://doi.org/10.1177/1094670511425697
Khokhar, S. & Apenten, R.K.O. (2003). Antinutritional Factors in Food Legumes and Effects of processing. 10
Knight, R. (2000). *Linking Research and Marketing Opportunities for Pulses in the 21st Century: Proceedings of the Third International Food Legumes Research Conference*. Springer Science & Business Media.
KRAV (n.d.). *KRAV – a Label for Organic Food* https://www.krav.se/en/this-is-krav/a-label-for-organic-food/ [2022-04-13]
KRAV (2022). Standards for KRAV-certified Production 2022. The KRAV association: Uppsala.
Lintula, J., Tuunanen, T. & Salo, M. (2017). Conceptualizing the Value Co-Destruction Process for Service Systems: Literature Review and Synthesis. *Proceedings of Hawaii International Conference on System Sciences*, 2017. https://doi.org/10.24251/HICSS.2017.197
Lemken, D., Knigge, M., Meyerding, S. & Spiller, A. (2017). The Value of Environmental and Health Claims on New Legume Products: A Non-Hypothetical Online Auction. *Sustainability*, 9 (8), 1340. https://doi.org/10.3390/su9081340
Lusch, R. & Vargo, S. (2014). *Service-dominant logic: Premises, perspectives, possibilities*. *Service-Dominant Logic: Premises, Perspectives, Possibilities*. https://doi.org/10.1017/CBO9781139043120
Lusch, R.F., Vargo, S.L. & O'Brien, M. (2007). Competing through service: Insights from service-dominant logic. *Journal of Retailing*, 83 (1), 5–18. https://doi.org/10.1016/j.jretai.2006.10.002
Matthies, B.D., D'Amato, D., Berghäll, S., Ekholm, T., Hoen, H.F., Holopainen, J., Korhonen, J.E., Lähtinen, K., Mattila, O., Toppinen, A., Valsta, L., Wang, L. & Yousefpour, R. (2016). An ecosystem service-dominant logic? – integrating the

ecosystem service approach and the service-dominant logic. *Journal of Cleaner Production*, 124, 51–64. https://doi.org/10.1016/j.jclepro.2016.02.109
Maxwell, J. (2012). Qualitative Research Design: An Interactive Approach / J.A. Maxwell.
McMichael, P. (2012). The land grab and corporate food regime restructuring. *The Journal of Peasant Studies*, 39 (3–4), 681–701. https://doi.org/10.1080/03066150.2012.661369
Messina, V. (2014). Nutritional and health benefits of dried beans. *The American Journal of Clinical Nutrition*, 100 Suppl 1, 437S–42S. https://doi.org/10.3945/ajcn.113.071472
Metcalf, G.E. & Weisbach, D. (2009). The Design of a Carbon Tax. *Harvard Environmental Law Review*, 33, 499
Mottet, A., de Haan, C., Falcucci, A., Tempio, G., Opio, C. & Gerber, P. (2017). Livestock: On our plates or eating at our table? A new analysis of the feed/food debate. *Global Food Security*, 14, 1–8. https://doi.org/10.1016/j.gfs.2017.01.001
OEC. (2020). *Dried Legumes in Canada - The Observatory of Economic Complexity*. https://oec.world/en/profile/bilateral-product/dried-legumes/reporter/can?redirect=true [2022-04-04]
Olsson, C. (2017). *Expanding the grain legume food production in Southern Sweden: qualitative insights from producers and representatives from the food industry.* Second cycle, A2E. Alnarp: SLU, Department of Biosystems and Technology
Olexova, R. & Kubickova, V. (2014). The evolution of the S-D logic approach and its impact on service science. *Journal of Service Science Research*, 6 (1), 99–124. https://doi.org/10.1007/s12927-014-0004-6
Paxton, A. (1994). *The Food Miles Report: The Dangers of Long Distance Food Transport*. SAFE Alliance.
Peas of Heaven. *(n.d.). Vegansk mat i Sverige*. https://peasofheaven.se/ [2022-01-25]
Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard business review*, *86*(1), 25-40.
Porter, M. E., & Kramer, M. R. (2019). Creating shared value. In *Managing sustainable business* (pp. 323-346). Springer, Dordrecht.
Poux, X., & Aubert, P. M. (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating. *Findings from the Ten Years For Agroecology (TYFA) modelling exercise, Iddri-AScA, Study*, *9*, 18.
Preissel, S., Reckling, M., Schläfke, N. & Zander, P. (2015). Magnitude and farm-economic value of grain legume pre-crop benefits in Europe: A review. *Field Crops Research*, 175, 64–79. https://doi.org/10.1016/j.fcr.2015.01.012
Rist, L., Feintrenie, L. & Levang, P. (2010). The livelihood impacts of oil palm: smallholders in Indonesia. *Biodiversity and Conservation*, 19 (4), 1009–1024. https://doi.org/10.1007/s10531-010-9815-z
Ritchie, H. & Roser, M. (2021). Forests and Deforestation. *Our World in Data*. https://ourworldindata.org/soy [2022-02-22]
Robson, M.C., Fowler, S.M., Lampkin, N.H., Leifert, C., Leitch, M., Robinson, D., Watson, C.A. & Litterick, A.M. (2002). The Agronomic and Economic Potential of Break Crops for Ley/Arable Rotations in Temperate Organic Agriculture. In: Sparks, D.L. (ed.) *Advances in Agronomy*. Academic Press, 369–427. https://doi.org/10.1016/S0065-2113(02)77018-1

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. & Foley, J.A. (2009). A safe operating space for humanity. *Nature*, 461 (7263), 472–475. https://doi.org/10.1038/461472a

Roos, A., Eggers, J., Mark-Herbert, C. & Lindhagen, A. (2018). Using von Thünen rings and service-dominant logic in balancing forest ecosystem services. *Land Use Policy*, 79, 622–632. https://doi.org/10.1016/j.landusepol.2018.08.046

Röös, E. (2020). *Hur mycket av de svenska baljväxterna hamnar på tallriken? – New legume food*. https://blogg.slu.se/new-legume-foods/2020/05/01/hur-mycket-av-de-svenska-baljvaxterna-hamnar-pa-tallriken/ [2022-05-30]

Röös, E., Carlsson, G., Ferawati, F., Hefni, M., Stephan, A., Tidåker, P. & Witthöft, C. (2020). Less meat, more legumes: prospects and challenges in the transition toward sustainable diets in Sweden. *Renewable Agriculture and Food Systems*, 35 (2), 192–205. https://doi.org/10.1017/S1742170518000443

Röös, E., de Groote, A. & Stephan, A. (2022). Meat tastes good, legumes are healthy and meat substitutes are still strange - The practice of protein consumption among Swedish consumers. *Appetite*, 106002. https://doi.org/10.1016/j.appet.2022.106002

Sasu-Boakye, Y., Cederberg, C. & Wirsenius, S. (2014). Localising livestock protein feed production and the impact on land use and greenhouse gas emissions. *Animal*, 8 (8), 1339–1348. https://doi.org/10.1017/S1751731114001293

Säll, S. & Gren, I.-M. (2015). Effects of an environmental tax on meat and dairy consumption in Sweden. *Food Policy*, 55, 41–53. https://doi.org/10.1016/j.foodpol.2015.05.008

Sánchez-Chino, X., Jiménez-Martínez, C., Dávila-Ortiz, G., Álvarez-González, I. & Madrigal-Bujaidar, E. (2015). Nutrient and nonnutrient components of legumes, and its chemopreventive activity: a review. *Nutrition and Cancer*, 67 (3), 401–410. https://doi.org/10.1080/01635581.2015.1004729

SCB. (2020). *Imports and exports of agricultural products and foodstuffs*. *Statistiska Centralbyrån*. http://www.scb.se/en/finding-statistics/statistics-by-subject-area/agriculture-forestry-and-fishery/general-statistics/general-agricultural-statistics/pong/tables-and-graphs/imports-and-exports-of-agricultural-products-and-foodstuffs/ [2022-01-18]

Schader, C., Muller, A., Scialabba, N.E.-H., Hecht, J., Isensee, A., Erb, K.-H., Smith, P., Makkar, H.P.S., Klocke, P., Leiber, F., Schwegler, P., Stolze, M. & Niggli, U. (2015). Impacts of feeding less food-competing feedstuffs to livestock on global food system sustainability. *Journal of The Royal Society Interface*, 12 (113), 20150891. https://doi.org/10.1098/rsif.2015.0891

Schmitt, E., Galli, F., Menozzi, D., Maye, D., Touzard, J.-M., Marescotti, A., Six, J. & Brunori, G. (2017). Comparing the sustainability of local and global food products in Europe. *Journal of Cleaner Production*, 165, 346–359. https://doi.org/10.1016/j.jclepro.2017.07.039

Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/3390 [2022-03-31]

Searchinger, T., Hanson, C., Ranganathan, J., Lipinski, B., Waite, R., Winterbottom, R., Dinshaw, A., Heimlich, R., Boval, M., Chemineau, P., Dumas, P., Guyomard, H., Kaushik, S., Makowski, D., Manceron, S. & Ben Ari, T. (2014). *Creating a sustainable food future. A menu of solutions to sustainably feed more than 9 billion people by 2050. World resources report 2013-14 : interim findings*. World Resources Institute. https://hal.archives-ouvertes.fr/hal-01129910 [2022-01-18]

Seufert, V., Ramankutty, N. & Foley, J.A. (2012). Comparing the yields of organic and conventional agriculture. *Nature*, 485 (7397), 229–232. https://doi.org/10.1038/nature11069

Sharma, A. (2021). A review on traditional technology and safety challenges with regard to antinutrients in legume foods. *Journal of Food Science and Technology*, 58 (8), 2863–2883. https://doi.org/10.1007/s13197-020-04883-8

Shen, J., Yuan, L., Zhang, J., Li, H., Bai, Z., Chen, X., Zhang, W. & Zhang, F. (2011). Phosphorus Dynamics: From Soil to Plant. *Plant Physiology*, 156 (3), 997–1005. https://doi.org/10.1104/pp.111.175232

Sibhatu, K.T. (2019). Oil Palm Boom and Farm Household Diets in the Tropics. *Frontiers in Sustainable Food Systems*, 3. https://doi.org/10.3389/fsufs.2019.00075

Sinclair, T.R. & Cassman, K.G. (1999). Green revolution still too green. *Nature*, 398 (6728), 556–556. https://doi.org/10.1038/19182

Sloane, A. & O'Reilly, S. (2013). The emergence of supply network ecosystems: a social network analysis perspective. *Production Planning & Control*, 24 (7), 621–639. https://doi.org/10.1080/09537287.2012.659874

Smetana, S., Mathys, A., Knoch, A. & Heinz, V. (2015). Meat alternatives: life cycle assessment of most known meat substitutes. *The International Journal of Life Cycle Assessment*, 20 (9), 1254–1267. https://doi.org/10.1007/s11367-015-0931-6

Smil, V. (2004). *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production*. MIT Press.

Smith, J., Lang, T., Vorley, B. & Barling, D. (2016). Addressing Policy Challenges for More Sustainable Local–Global Food Chains: Policy Frameworks and Possible Food "Futures." *Sustainability*, 8 (4), 299. https://doi.org/10.3390/su8040299

Soetan, K.O. & Oyewole, O.E. (2009). The need for adequate processing to reduce the anti- nutritional factors in plants used as human foods and animal feeds: A review. *African Journal of Food Science*, 3, 223-232.

Springmann, M., Wiebe, K., Mason-D'Croz, D., Sulser, T.B., Rayner, M. & Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *The Lancet Planetary Health*, 2 (10), e451–e461. https://doi.org/10.1016/S2542-5196(18)30206-7

Stockeld Dreamery (n.d.). *Stockeld Dreamery*. https://stockeld.com/ [2022-01-25]

Swedish Board of Agriculture (Jordbruksverket). (2021). *Dokumentation från aktiviteter inom livsmedelsstrategin*. https://jordbruksverket.se/mat-och-drycker/livsmedelsstrategi-for-sverige/dokumentation-fran-aktiviteter-inom-livsmedelsstrategin [2022-04-18]

Swedish Board of Agriculture (Jordbruksverket). (2022a). *Förgröningsstöd*. https://jordbruksverket.se/stod/lantbruk-skogsbruk-och-tradgard/jordbruksmark/forgroningsstod [2022-04-05]

Swedish Board of Agriculture (Jordbruksverket). (2022b). *Ersättningar för ekologisk produktion och omställning till ekologisk produktion*. https://jordbruksverket.se/stod/lantbruk-skogsbruk-och-tradgard/jordbruksmark/ekologisk-produktion-och-omstallning-till-ekologisk-produktion [2022-04-05]
Swedish Food Agency (Livsmedelsverket). (n.d.). *Måltidsmodellen*. https://www.livsmedelsverket.se/maltidsmodellen [2022-03-11]
Swedish Food Agency (Livsmedelsverket). (2012). *Riksmaten - Vuxna 2010-11 Livsmedels- och näringsintag bland vuxna i Sverige*. Uppsala: Livsmedelsverket. http://www.slv.se/upload/dokument/rapporter/mat_naring/2012/riksmaten_2010_2011.pdf [2021-11-19]
Swedish Food Agency (Livsmedelsverket). (2022a). *Om oss*. https://www.livsmedelsverket.se/om-oss [2022-02-10]
Swedish Food Agency (Livsmedelsverket). (2022b). *Näringsrekommendationer*. https://www.livsmedelsverket.se/matvanor-halsa--miljo/kostrad/naringsrekommendationer [2022-02-10]
Swedish Parliament (Riksdagen). (2021). *Hållbar konsumtion för att nå netto noll senast 2045 Motion 2020/21:2025 av Mattias Vepsä och Magnus Manhammar*. https://www.riksdagen.se/sv/dokument-lagar/dokument/motion/hallbar-konsumtion-for-att-na-netto-noll-senast_H8022025 [2022-04-13]
Swedish Government (Regeringen). (2020). *En livsmedelsstrategi för jobb och hållbar tillväxt i hela landet*. https://www.regeringen.se/regeringens-politik/en-livsmedelsstrategi-for-jobb-och-hallbar-tillvaxt-i-hela-landet/ [2022-01-18]
Tidåker, P., Karlsson Potter, H., Carlsson, G. & Röös, E. (2021). Towards sustainable consumption of legumes: How origin, processing and transport affect the environmental impact of pulses. *Sustainable Production and Consumption*, 27, 496–508. https://doi.org/10.1016/j.spc.2021.01.017
UK GOV. (2018). *Soft Drinks Industry Levy comes into effect*. https://www.gov.uk/government/news/soft-drinks-industry-levy-comes-into-effect [2022-04-21]
Vargo, S.L. (2008). Customer Integration and Value Creation: Paradigmatic Traps and Perspectives. *Journal of Service Research*, 11 (2), 211–215. https://doi.org/10.1177/1094670508324260
Vargo, S.L. & Lusch, R.F. (2012). The Nature and Understanding of Value: A Service-Dominant Logic Perspective. *Review of Marketing Research*. 1–12. https://doi.org/10.1108/S1548-6435(2012)0000009005
Vargo, S.L. & Lusch, R.F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68 (1), 1–17. https://doi.org/10.1509/jmkg.68.1.1.24036
Vargo, S.L. & Lusch, R.F. (2008). Why "service"? *Journal of the Academy of Marketing Science*, 36 (1), 25–38. https://doi.org/10.1007/s11747-007-0068-7
Vargo, S.L. & Lusch, R.F. (2016). Institutions and axioms: an extension and update of service-dominant logic. *Journal of the Academy of Marketing Science*, 44 (1), 5–23. https://doi.org/10.1007/s11747-015-0456-3
Vargo, S.L. & Lusch, R.F. (2017). Service-dominant logic 2025. *International Journal of Research in Marketing*, 34 (1), 46–67. https://doi.org/10.1016/j.ijresmar.2016.11.001

Vargo, S.L., Maglio, P.P. & Akaka, M.A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, 26 (3), 145–152. https://doi.org/10.1016/j.emj.2008.04.003
Wang, Y., Wang, Z., Fu, L., Chen, Y. & Fang, J. (2013). Legume consumption and colorectal adenoma risk: a meta-analysis of observational studies. *PloS One*, 8 (6), e67335. https://doi.org/10.1371/journal.pone.0067335
Washington Post. (2022). *Demand for meat is destroying the Amazon. Smarter choices at the dinner table can go a long way to help*. https://www.washingtonpost.com/climate-solutions/2022/03/09/amazon-rainforest-deforestation-beef/ [2022-03-25]
Wasserman, S. & Faust, K. (1994). *Social Network Analysis: Methods and Applications*. Cambridge University Press.
Watson, C.A., Reckling, M., Preissel, S., Bachinger, J., Bergkvist, G., Kuhlman, T., Lindström, K., Nemecek, T., Topp, C.F.E., Vanhatalo, A., Zander, P., Murphy-Bokern, D. & Stoddard, F.L. (2017b). Chapter Four - Grain Legume Production and Use in European Agricultural Systems. In: Sparks, D.L. (ed.) *Advances in Agronomy*. Academic Press, 235–303. https://doi.org/10.1016/bs.agron.2017.03.003
Weber, C.L. & Matthews, H.S. (2008). Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environmental Science & Technology*, 42 (10), 3508–3513. https://doi.org/10.1021/es702969f
Wigboldus, S., Klerkx, L., Leeuwis, C., Schut, M., Muilerman, S. & Jochemsen, H. (2016). Systemic perspectives on scaling agricultural innovations. A review. *Agronomy for Sustainable Development*, 36 (3), 46. https://doi.org/10.1007/s13593-016-0380-z
Willer, E.H., Schlatter, B., Trávní, J., Kemper, L. & Lernoud, J. (n.d.). The World of Organic Agriculture Statistics and Emerging Trends 2020. 337
Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L.J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J.A., De Vries, W., Majele Sibanda, L., Afshin, A., Chaudhary, A., Herrero, M., Agustina, R., Branca, F., Lartey, A., Fan, S., Crona, B., Fox, E., Bignet, V., Troell, M., Lindahl, T., Singh, S., Cornell, S.E., Srinath Reddy, K., Narain, S., Nishtar, S. & Murray, C.J.L. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393 (10170), 447–492. https://doi.org/10.1016/S0140-6736(18)31788-4
Williams, H., Lindström, A., Trischler, J., Wikström, F. & Rowe, Z. (2020). Avoiding food becoming waste in households – The role of packaging in consumers' practices across different food categories. *Journal of Cleaner Production*, 265, 121775. https://doi.org/10.1016/j.jclepro.2020.121775
World Bank. (2018). *World Bank Open Data | Data*. https://data.worldbank.org/ [2022-04-04]
WTO. (2019). World Trade Statistical Review. *World Trade Organisation.* https://www.wto.org/english/res_e/statis_e/wts2019_e/wts19_toc_e.htm
Xiao, Y. & Watson, M. (2019). Guidance on Conducting a Systematic Literature Review. *Journal of Planning Education and Research*, 39 (1), 93–112. https://doi.org/10.1177/0739456X17723971

Zander, P., Amjath-Babu, T.S., Preissel, S., Reckling, M., Bues, A., Schläfke, N., Kuhlman, T., Bachinger, J., Uthes, S., Stoddard, F., Murphy-Bokern, D. & Watson, C. (2016). Grain legume decline and potential recovery in European agriculture: a review. *Agronomy for Sustainable Development*, 36 (2), 26. https://doi.org/10.1007/s13593-016-0365-y

Zhu, B., Sun, Y., Qi, L., Zhong, R. & Miao, X. (2015). Dietary legume consumption reduces risk of colorectal cancer: evidence from a meta-analysis of cohort studies. *Scientific Reports*, 5, 8797. https://doi.org/10.1038/srep08797

Acknowledgements

I thank all the lecturers in the courses that I have taken for contributing to my knowledge. Amongst them, I give special thanks to Cecilia Mark-Herbert, my supervisor and lecturer for her inspiring energy, teaching and guidance. Furthermore, I thank the participants of the study for their open dialogue and contributions to this study, the environment and society.

Appendix 1 - Swedish food system actors

Appendix 1 provides brief descriptions of some important actors within the Swedish food system.

From Sweden (Från Sverige)
From Sweden is a Swedish food label which indicates a product is grown, fed, raised, processed, packaged, and distributed in Sweden. The label is an easily identifiable bright yellow and blue and simplifies the purchasing process for customers that want to purchase Swedish products. According to their framework, the meat and dairy contained in products with several ingredients such as fruit yoghurt or sausage must be 100% Swedish in origin. Non-meat and non-dairy ingredients must be at least 75% Swedish in origin. There is currently no requirement on the origin of animal fodder (From Sweden n.d.).

KRAV
Established in 1985, KRAV is the main organisation in Sweden that sets standards and regulates certified organic labelling. KRAV standards go beyond the EU-organic labelling conventions and strives for improved biological diversity, climate outcomes, animal welfare, employee working conditions, and protection of the environment and health (KRAV n.d.).

The Swedish Food Agency (Livsmedelsverket)
The Swedish Food Agency (**SLV**) is the central authority in the Swedish food industry which encompasses a wide range of responsibilities which will be explained in this section. SLV sets and audits food health and safety guidelines which includes from diet recommendations and appropriate food storage methods. On market level, SLV steers public procurement strategies for meals in schools, hospitals, and elderly care. Moreover, SLV sets targets for Sweden's food strategy which is the base for sustainable food policy by focusing on the following core areas: regulations, consumers, markets, and innovation (Swedish Food Agency 2022). Thus, SLV plays a significant role in directly influencing consumer behaviour through dietary recommendations and by influencing the current

sociotechnical paradigm through its involvement in regulations, markets, and innovation.

SLV offers dietary advice based on Nordic Nutrition Recommendations released in 2012 which focuses on public health outcomes primarily on micro and macronutrient intake. SLV's recommendations are only qualitative, offering general advice on increasing vegetable, fruit, legume, and seafood intake whilst reducing animal fats and processed meat. Amongst the recommendations, SLV offers a visual tool for portioning meals called the *plate model*, which divides a plate into sectors so users can appropriately portion different food groups such as carbohydrates, proteins, and vegetables (Swedish Food Agency n.d.). According to SLV, an updated Nordic Nutrition Recommendation study to be published in 2022 will focus on sustainability and form the future basis for recommendations (Swedish Food Agency 2021).

Appendix 2 - Tables of data and definitions

Table A1. Glossary of terms related to service-dominant logic (Lusch and Vargo 2014)

Word	Definition
Beneficiary	Opposed to a consumer. An actor that integrates their own operant resources and stands to gain from a value proposition
Consumer	Goods-dominant terminology. An actor that consumes or destroys value. Replaced by 'beneficiary', 'customer' or the generic term 'actor'
Operand Resources	Tangible assets that require an action to be performed on them to provide value such as natural resources
Operant Resources	Intangible assets that are able to act on other resources to create value such as human resources
Service	A process of integrating competencies rather than a quantifiable unit of output
Services	Goods-dominant terminology. A non-tangible good or value-enhancing addition to a good
Value	The total sum of attributes offered in a value proposition
Value proposition	The service-dominant perspective of a transaction based on the sum of firm and beneficiary operant resources mediated by contextual factors
Value-in-context	Value as mediated by the economic, social and environmental context
Value-in-exchange	Goods-dominant terminology. The value accrued in a transaction usually measured in monetary value

Table A2. Nutrient content of different grain legumes and animal meats. Adapted from Röös et al. (2020)

	Serving size (g)	Energy (kcal)	Protein (g)	Fat (g)	Total Dietary Fiber (g)	Iron (mg)	Potassium (mg)	Folate (µg)
Grain legumes, cooked with salt								
White beans	100	108	8	1	7	3	415	81
Brown beans	100	137	9	1	13	2	292	59
Faba beans	100	110	8	0	5	2	268	104
Gray peas	100	130	10	1	9	2	290	4
Yellow peas	100	104	7	0	4	2	251	7
Green lentils	100	127	9	1	9	3	360	40
Meat products								
Beef chuck, boiled	100	184	26	8.8	0	3.3	224	4
Chicken breast, fillet, fried	100	134	27	2.5	0	0.3	361	20
Pork collar or chaps, fried	100	202	21	13	0	1.8	268	7
Liver patties, fried	100	146	13	6.4	0	9.6	385	114

Table A3. Agricultural production area of grain legumes and pulses in MHa in 2018 (World Bank 2018; FAOstat 2020)

Item	Global	Europe	Sweden
Bambara beans	0.35	0.00	0.000
Beans, dry	36.22	0.21	0.000
Broad beans, horse beans, dry	2.85	0.64	0.026
Chickpeas	16.18	0.82	0.000
Cow peas, dry	14.26	0.01	0.000
Lentils	5.51	0.27	0.000
Lupins	0.98	0.23	0.000
Peas, dry	7.45	2.74	0.022
Pigeon peas	5.48	0.00	0.000
Pulses nes	6.07	0.65	0.001
Soybeans	124.05	5.66	0.000
Vetches	0.34	0.13	0.000
Total	219.39	11.59	0.05
Total arable land	1394.78	98.94	2.55
Percentage of legume and pulse production on arable land	15.7%	11.7%	1.9%

Appendix 3 – Interview guide

Interview Guide

Thank you for choosing to take part in my thesis project. I'm a master student in the Sustainable Food Systems programme at the Swedish University of Agricultural Sciences. The aim of the project is to investigate the legume value chain and understand how actors interact within the system.

General - Background

1. Could you briefly tell me about your educational and work background?
2. What is your current title/role at your company?

Value chain

1. What is the work your business does with legumes?
    a. What kinds of varieties, volumes, and origins?
    b. Why these varieties and origins?
    c. If not Swedish in origin, why?

2. What challenges do you see in your value chain?

3. How do you currently or plan to address these challenges?

4. What other actors do you collaborate with?
    a. What kind of interaction do you have with farmers?
    b. What kind of interaction do you have with wholesalers or processors?
    c. What kind of interaction do you have with policy makers?
    d. What kind of interaction do you have with researchers?
    e. What kind of interaction do you have with consumers or consumer groups?
    f. Any other stakeholder groups?

5. Is there anything important about your role in the value chain or the value chain as a whole that you would like to discuss?

Competitive advantage

1. What features of legumes make them advantageous?

2. What features of your product make them advantageous?

    a. How do you communicate these features to customers (B2C and B2B)?

3. Profitability was a major theme in the Swedish Food Strategy Conference, what does profitability mean for your business?
    a. Do you see profitability being a problem for other parts of the chain?
    b. How do you think they could be supported?
    c. Margins are determinant on the willingness of consumers to pay – what is your perspective on the market status for legumes and innovative products based on legumes?

4. Support for legumes may be included in the CAP 2023, what effect do you see this having on the value chain?

Popular Science Summary

Legumes – A protein source for the future

Recent scientific evidence shows that current systems have surpassed the acceptable limits for land-system change, climate change, biodiversity loss, as well as phosphorus and nitrogen flows. These problems In the context of increasingly energy intensive diets and expected population growth to 10 billion in by 2050 means that society needs more sustainable food solutions which meet the protein demands of the future.

Legumes are a plant of the Fabaceae family and include beans, peas, peanuts, lentils, and clover. Legumes are high in protein, fibre, micronutrients, and act as natural fertilizer which reduces dependence on synthetic fertilizers produced by fossil fuels. In comparison to animal protein, legume-based protein also releases significantly less greenhouse gas emissions. However, cultivation and consumption of legumes is low in Sweden when compared to global production trends and dietary recommendations.

To solve these problems, businesses and organisations are working to develop innovative products and systems to make legumes attractive for farmers that grow them, companies that process them, and customers that want tasty, convenient, and sustainable products. Understanding how these organisations solve problems is important for creating the most effective solutions that have the most impact. For the thesis project, I interviewed five different organisations to better understand their strategies. The organisations include a legume wholesaler, legume-based cheese processor, food innovation incubator, a network for collaboration of organisations interested in legumes and a project for improving school meal systems. The results showed that public and private organisations are important in solving problems and creating new innovations. Interestingly, the results also showed that organisations should work together to solve large and complex problems. Collaboration with mutual goals encourages the creation of comprehensive strategies within political, environmental, education, and economic systems which likely have stronger effects than organisations acting alone.