

## MASTER

### Contextualized Sustainability Assessment

### A Tool for Assessing Future Business Models in Goat and Poultry Value Chains

Teunis, L.K.

*Award date:*  
2023

[Link to publication](#)

#### **Disclaimer**

This document contains a student thesis (bachelor's or master's), as authored by a student at Eindhoven University of Technology. Student theses are made available in the TU/e repository upon obtaining the required degree. The grade received is not published on the document as presented in the repository. The required complexity or quality of research of student theses may vary by program, and the required minimum study period may vary in duration.

#### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain

# Contextualized Sustainability Assessment: A Tool for Assessing Future Business Models in Goat and Poultry Value Chains.

by

**Loes Karlijn Teunis**

MSC THESIS

**Assessment committee**

Member 1 (chair): dr. M. Hauck  
Member 2: dr. ir. A.C. Valkenburg  
Member 3: dr. E. Mas Tur

**Graduation**

Program: Innovation Sciences  
Capacity group: Technology, Innovation &  
Society  
Supervisor: dr. M. Hauck  
Date of defense: August 24, 2023  
Student ID: S148793  
Study load (ECTS): 30  
Track: Global Sustainability

This thesis is public and Open Access.

This thesis has been realized in accordance with the regulations as stated in the TU/e Code of Scientific Conduct.

Disclaimer: the Department of Industrial Engineering and Innovation Sciences of the Eindhoven University of Technology accepts no responsibility for the contents of MSc theses or practical training reports.

## **Preface**

Hereby I present my thesis to fulfill my final requirement to complete the Master Innovation Sciences.

I would like to thank dr.ir. Rianne Valkenburg for the excellent guidance and unwavering support. I am also deeply thankful to dr. Mara Hauck and dr. Elena Mas Tur for their invaluable supervision and their willingness to share their expertise. Special appreciation goes to Britt Smulders inviting me to be part of this research project, and to Mariëlle Besling, and Wil Kuijpers for their regular check-ins during this process.

Finally, I want to thank my family and friends for being there for me. And I would like to thank you, the reader, for your time and interest. I hope you find this thesis an enjoyable read.

## **Abstract**

Building a sustainable society is one of the biggest challenges of the modern world. Sustainability can be characterized by multiple interpretations, the absence of a singular best solution, and the generation of externalities. Addressing this complexity brought forward by wicked nature of sustainability, makes the development of a robust Sustainability Assessment (SA) tool, inherently challenging. Within the scope of the EU-funded research project Code: Re-farm, the need existed to develop a SA tool capable of evaluating and comparing future business models. Leveraging the inherent wicked nature of sustainability, a design science research approach was adopted. This involved a cyclical process of exploration, synthesis, creation and evaluation, comprising three studies. Study One, the exploration phase involved a literature review, discerning the strengths and weakness of current approaches to SA in the agriculture sector. Subsequently in Study Two, stakeholder interviews were employed to bridge the gap between exploration and synthesis. A thematic analysis on the interviews and relevant documents resulted in the main sustainability considerations for the goat and poultry value chains were found. Study Three encompassed the design, evaluation, and validation of the tool, merging both creation and evaluation. This process informed the development of an SA tool in which the perspectives of the academic literature, project stakeholders, and experts were recognized. In conclusion, this research serves as evidence of the possibility to develop an SA tool, which acknowledges a multitude of perspectives, while simultaneously being able to evaluate and compare sustainability of business models.

# Table of Contents

1.	Introduction.....	5
1.1	Sustainability Assessment.....	5
1.2	Challenges in SA.....	6
1.3	Sustainability assessment for wicked problems.....	7
1.4	Why this reflexive view on sustainability.....	8
1.5	Research Design.....	9
2.	Study One: Contextualizing SA.....	12
2.1	Introduction.....	12
2.2	Method.....	12
2.2.1	Data analysis.....	14
2.4	Results.....	14
2.4.1	Sustainability framework for agricultural contexts.....	14
2.4.2	A multi-stakeholder approach.....	15
2.4.3	Synergies and trade-offs.....	18
2.4.4	Sustainability is a continuous process.....	19
2.4.5	Goal setting.....	19
2.5	Conclusions.....	20
3.	Study Two: Sustainability Considerations.....	22
3.1	Introduction.....	22
3.2	Method.....	22
3.2.1	Selection of participants.....	24
3.2.2	Selection of (policy) documents.....	25
3.2.3	Data analysis.....	25
3.4	Results.....	26
3.4.1	Economic sustainability.....	26
3.4.2	Institutional sustainability.....	28
3.4.3	Environmental sustainability.....	30
3.4.4	Social sustainability.....	31
3.4.5	Synergies and tradeoffs.....	33
3.4.6	Sustainability Goals: system requirements.....	33
3.4.7	Requirements Code: Re-farm.....	35
3.5	Conclusions.....	36
4.	Study Three: SA tool.....	37
4.1	Introduction.....	37
4.2	Method.....	37
4.2.1	Tool development.....	38
4.2.2	Evaluation and Validation.....	38
4.3	Analysis.....	39

4.3.1	Evaluation .....	39
4.3.2	Validation .....	40
4.4	Results .....	41
4.4	Conclusion.....	44
5.	Conclusions.....	46
6.	Discussion.....	47
6.1	Validity .....	47
6.2	Results and interpretation .....	47
6.3	Limitations .....	48
6.4	Implications .....	50
6.5	Future.....	50
7.	Literature.....	51
	Appendix A - Semi-structured interview questions.....	54
	Appendix B - Interviews.....	55
	Appendix B.1: Interview 1 .....	55
	Appendix B.2: Interview 2 .....	65
	Appendix B.3: Interview 3 .....	80
	Appendix B.4: Interview 4 .....	101
	Appendix B.5: Interview 5 .....	116
	Appendix B.6: Interview 6 .....	132
	Appendix C – First iteration SA tool.....	146
	Appendix D – Sustainability assessment results .....	148

# 1. Introduction

Sustainable food systems are of crucial importance to humanity. However, current agri-food systems are under pressure from both internal and external pressure (Hubeau et al., 2017). As these food systems are becoming more fragile, the need arises to transform these systems. Therefore, the European Union collaborates with stakeholders from all over Europe aiming to change the trajectory of farming systems in Europe. One example of a research project getting funded by the EU for transitions and societal challenges is Code: Re-farm. Code: Re-farm studies both goat and poultry farming systems, with a specific focus on how the type of farming system, intensive or extensive, determines the quality of products. However, in addition to the study to understand how farming systems affect product quality, alternative business models are designed for both the poultry and goat value chains. By working in close collaboration with the European agriculture sector, Code Re:farm is developing scenarios for possible, desirable futures of the sector. Using these imagined futures, the past can be actively reconstructed into alternative ecosystem structures and accompanying business models. This ecosystem perspective in the business model literature posits that firms are part of a larger economic community, where firms can interact with other organizations and individuals (Moore, 1996 as cited in Zott & Amit, 2013). In this view, it is understood that value is created through a firm's cooperation with the members of its ecosystem (Zott & Amit, 2013). The ambition of Code: Re-farm is to develop alternative business models based on reconfigurations of the business ecosystem. Currently, Code: Re-farm is working on developing these new ecosystem structures and business models. As part of the business model development process, these business models will need to be evaluated on how sustainable they are. For this evaluation, an assessment tool is needed. There is no shortage of tools that aim to assess sustainability. However, tools that are often used, for example, the SOLID rapid assessment tool which is used to measure sustainability on dairy farms (Measures, 2013), require a large quantity of data, which in the case of the alternative business models in Code: Re-farm cannot be obtained. In addition, the scope of existing tools may not be appropriate to assess business models for goat and poultry farming systems, especially if the tools focus on farm-level assessments. Therefore, the goal of this thesis is to develop a sustainability assessment (SA) tool to assess the alternative business models, specifically tailored to the context of goat and poultry value chains. In this chapter, different research paradigms on SA will be explored, this will inform from what perspective SA will be deployed in this thesis. In the last paragraph of this chapter, the research design will be explained.

## 1.1 Sustainability Assessment

The initial challenge in developing a SA tool is determining how to frame the concept of sustainability. In this thesis, sustainability is approached as a "wicked problem". What makes sustainability a wicked problem is that the concept has no single definition, is unique, is connected to other problems, and does not have an objectively best solution (Dijk et al., 2017; Rittel & Webber,

1973). This wickedness can also be observed in the literature on SA. SA is widely regarded as input for decision-making, but there is no agreement on the specific purpose of SA, and the operationalization of sustainability. Some key differences can be ascertained by contrasting the definitions authors give to SA, and which elements of SA are highlighted or omitted. For example, Dijk et al. (2017) define SA as approaches that “*operationalize sustainability concepts for decision-making, mostly within but also outside governments*” (Dijk et al., 2017, p. 305). In contrast, Hugé et al., (2013, p. 188) define SA as “*a process aimed at operationalizing sustainability development as a decision-guiding strategy through identification of future consequences of current and planned actions*”. Where Dijk et al. (2017) emphasize the operationalization of sustainability concepts, and the use of these operationalized concepts as input for decision-making, Hugé et al. (2013) emphasize the operationalization of sustainable development. The concept of “sustainable development” originated from the attempt to reconcile economic development with the need for ecological and social well-being (Purvis et al., 2019). In contrast, in Dijk et al. is the emphasis on economic development is omitted. A less specific, but more all-encompassing definition is given by (Gibson, 2016, p.16) “*sustainability assessment is essentially an organized approach to deliberation and decision making*”. What seems clear is that SA is used to facilitate decision-making, however, many challenges regarding decision-making exist in the context of sustainability. Two reasons for these challenges will be discussed, as they inform the choice of conceptualization of sustainability for this thesis: the wicked character of sustainability, and the lack of theoretical underpinnings of the concept. Of course, many more conceptualizations of SA exist, these definitions are a small part of the existing literature on SA. However, these differences are representative of the different definitions of sustainability. As sustainability and SA can be understood in many different ways, the development of a rigorous and relevant SA tool poses some challenges to tool developers.

## **1.2 Challenges in SA**

Concerns about SA have been voiced in the scientific community and policy circles about the rigor of SA (Sala et al., 2015). The primary concern stems from the intrinsic wicked character of sustainability, specifically questioning whether SA is able to provide a reliable methodology that is able to measure sustainability (Dijk et al., 2017; Hugé et al., 2013; Sala et al., 2015; Voß et al., 2006; Waas et al., 2011). Due to its wicked character, sustainability is captured by a certain nebulosity, as many interpretations of sustainability co-exist (Hugé et al., 2013; Waas et al., 2011). These many interpretations of sustainability make both interpretation of the problem and implementation of solutions more difficult. Another challenge inherent to the different conceptualizations of sustainability is that its steering potential gets undermined (Waas et al., 2011). In addition to the many interpretations of sustainability making objective assessment difficult, if not impossible, often used framings to conceptualize sustainability lack a theoretical underpinning (Purvis et al., 2019). This lack of theoretical underpinning has been created as different schools of thought adopted ‘sustainability’ as



a common language, with, however, competing conceptualizations. This ambiguity makes the operationalization of frameworks for sustainability more difficult, as these frameworks may struggle to maintain a theoretical foundation (Purvis et al., 2019).

Existing SA methods can broadly be distinguished on a scale from analytical approaches based on positivist epistemologies, to reflexive approaches, based on either constructionist or transformational epistemologies (Hugé et al., 2013; Matthews et al., 2019). An example of the first type of method is the life cycle assessment (LCA) approach. LCA is an approach that uses quantitative assessment and evaluation of input, output, and environmental impacts of the life cycle of a product or human activity (de Bruijn et al., 2002). However, these approaches are less suitable for addressing wicked problems, as the methodology behind these approaches does not acknowledge the multiple perspectives on sustainability issues (Notarnicola et al., 2017). In addition, these approaches rely on the availability of existing data for its assessment procedure. This assessment method is, therefore, less suitable for assessing more conceptual topics, about which little additional information is known (Matthews et al., 2019). To address wicked problems for topics on which not much additional data can be collected, an alternative approach to SA is necessary. On the other side of the SA continuum are reflexive approaches, which place more emphasis on change and movement. Reflexive approaches are expected to be more appropriate when trying to address sustainability challenges in the context of wicked problems.

### **1.3 Sustainability assessment for wicked problems**

The second perspective on SA is a reflexive approach to sustainability. This approach asserts that sustainability cannot be constructed beforehand, because goals and definitions of sustainability are continuously changing and updated. Therefore, for SA to measure the distance between the current state and a specific sustainability objective is not the most important element, but having the right processes in place to monitor and update the goals (Binder et al., 2010; Gibson, 2016; Voß et al., 2006; Waas et al., 2014). Voß et al. (2006) developed criteria on how to govern sustainable development, as a practical implementation of sustainable development is missing. The argument made by Voß et al. (2006) is that modernist approaches to problem-solving are not equipped to deal with wicked problems and subsequently cause externalities not beneficial to sustainable development. To deal with these complex problems, a different method of problem-solving is needed, a reflexive method.

In this reflexive view on sustainability and SA, criticisms are expressed on how sustainable development is governed. Sustainability goals and assessment cannot be decided on permanently but should be decided upon through participatory processes for specific situations (Voß et al., 2006). The reason why sustainability goals and assessment cannot be decided upon permanently is that the conceptualization of sustainability is developed from uncertain knowledge and social evaluations. Over time, the knowledge and the social evaluations will evolve, and therefore the definition of

sustainability will change accordingly. Knowledge production on socio-ecological systems will increase over time with scientific progress. In addition, value changes may occur and will steer socio-ecological transformation from within. Therefore, the values that inform social evaluations will lose their importance, because they are successfully followed. Because of these characteristics of sustainability, sustainability is a moving target, and sustainability can only be ascertained through processes of iterative and participatory goals formulation. Broad participation of societal actors is required in this process of goal formulation, as these actors' values and perceptions of (sustainability) problems are essential for sustainable social development.

From a political science perspective, this reflexive approach to sustainability is a method for incorporating different types of knowledge in the assessment process. Dijk et al. (2017) posit sustainability is a wicked problem and therefore, for assessments to be effective SA needs to be reflexive about the definition and criteria for sustainable solutions. Dijk et al. (2017) develop a practical framework on how to practically deal with sustainability assessment and problem structuring. The authors argue that SA, especially when performed in the context of policy problems, is a method of problem structuring. However, some SA tools neglect either normative deliberations on sustainability or factual analysis of the sustainability issue at hand. To overcome these inherent disadvantages, a mixed-methods approach is suggested. By combining the viewpoints of both scientific experts and other representatives affected by the sustainability problem, Dijk et al. (2017) found SA was able to address the wicked nature of sustainability issues.

Sustainability can also be defined from a transition science perspective, in which transformation from one state to a new sustainable state is emphasized. Beers et al. (2019) define a transition as a journey, or the process of moving parties from one state to another. SA has the responsibility in these transitions to construct the meaning of what that desired state is. It is important to note that the end-state should not be defined as a fixed goal, but there needs to be a constant process of negotiation of meaning. In this process, a diverse range of actors should engage in social processes, outcomes are expected to be changed practices, discourses, social networks, technologies, infrastructure, and cultural change. Beers et al. (2019) emphasize a process-based view of sustainability, highlighting the primary objective of sustainability transitions should be the transformation from one state to another. Even though these transition processes are overarching to SA, it does give insight into the role of SA in sustainability transitions.

Overall, this perspective on a reflexive process on SA shows that for SA to handle wicked problems, a new conceptualization of sustainability is warranted. Sustainability can be worked towards, but not reached. By acknowledging the context and having the appropriate processes in place to study sustainability through a reflexive process, the applicability of SA can be improved.

## **1.4 Why this reflexive view on sustainability**

A failure to recognize a wide diversity of perspectives in SA is expected to decrease the

relevance of results at best (Dijk et al., 2017; Gibson, 2016), or an outright crisis at worst (Remkes, 2022). Therefore, this thesis explores how to develop a SA tool for the alternative business models for the goat and poultry value chains, while simultaneously embracing the diversity of perspectives on sustainability within the goat and poultry value chain, while still being able to guide decision-making towards sustainability. By conceptualizing sustainability as a reflexive process, it will be possible to acknowledge sustainability is a product of the current state of knowledge production and social evaluations. In addition, reflexive processes do not solely rely on the existence of quantitative data for decision-making, these processes underscore the significance broad societal participation in decision-making processes. This is better suited the in context of Code: Re-farm, as the business models are not yet exists meaning quantitative data for measurement is lacking. The method for developing a SA tool will be discussed in the following paragraph.

## **1.5 Research Design**

Within this thesis, a design science approach will be taken to answer the research questions. Design science aims to address and solve managerial and organizational challenges (Keskin & Romme, 2020). The use of a design science approach is appropriate in the context of this thesis because SA is in essence a method to guide decision-making. As seen in the introduction, there is little agreement on the theory behind SA, as sustainability frameworks are criticized for their lack of theoretical underpinnings or the different interpretations of what SA is. This does not diminish the fact that SA is very relevant to guide action toward decision-making, and action toward sustainability is crucial for the development of more sustainable food systems. This steering of decision-making comes inherently with challenges of what the appropriate tool and methodologies are for decision-making. This thesis adopts a design science research approach to contextualize SA relevant within the domain of business model development for goat and poultry value chains.

Design science is a research paradigm aiming to close the gap between theory and practice, through a process of developing and evaluating artifacts that address complex problems and contribute to both academic knowledge and real-world application. This methodology allows researchers to move from a present state to a future, desired state (Keskin & Romme, 2020). Design science research consists of four consecutive steps: exploration, synthesis, creation, and evaluation (Keskin & Romme, 2020). The first step, exploration, is about creating an in-depth understanding of the problem space. Oftentimes, literature reviews are an appropriate method to understand the causes of a problem. The second step is synthesis, in this step emphasis is placed on sensemaking, which may specifically serve as input for design requirements. Methods for synthesis can be but are not limited to, thematic analysis, context analysis, or narrative analysis. Step three, creation, is about the development of an artifact as a solution to the problem at hand. Oftentimes, visualization and prototyping are used as methods in the creation step. The final step in a design science research cycle is evaluation, which assesses the value of the solution. Evaluations often take place in the context of

their completeness, consistency, performance, or usability. These four steps inform the research design of this thesis, this process is shown in Figure 1.

**Figure 1**

*Methodology within the Design Science Research Cycle*



*Note.* Adapted from “Mixing Oil with Water: How to Effectively Teach Design Science in Management Education?” 2020 by Keskin, D., & Romme, *BAR - Brazilian Administration Review*, 17(1) p. 11 (<https://doi.org/10.1590/1807-7692bar2020190036>). CC by 4.0.

To answer to research questions, this thesis addresses the research questions in three different successive studies. The first study concerns itself with the exploration of the problem space. This is done through a literature review on SA tools which are currently used to assess sustainability in the agriculture sector. This review provides guidelines on how to develop a SA tool that is suitable to assess sustainability in the context of goat and poultry husbandry systems. The research questions for Study One are:

*RQ1: What is a suitable framework to study sustainability in the context of agricultural farming systems?*

*RQ2: How to operationalize this framework to assess sustainability in agricultural farming systems?*

The second study explores what the most pressing sustainability challenges are in the goat and poultry value chains. Therefore, sector-specific sustainability considerations are developed. To

develop these considerations, policy documents are studied, and interviews are held to explore the current sustainability challenges. This study provides the sustainability considerations that need to be acknowledged and acted upon to create more sustainable goat and poultry husbandry systems, in the context of the farming ecosystem. The research question for Study Two is:

*RQ3: What are the main sustainability considerations that should be acknowledged and acted upon within the poultry and goat value chains in Code: Re-farm?*

The third study encompasses the development of the sustainability criteria as a method for measuring sustainability of the future business models as developed in Code: Re-farm. These criteria are the main input of the tool development. In addition to the criteria and tool development, the criteria need to be validated based on their usability and whether they capture the essence of the sustainability criteria. This third and final study presents the contextualized SA tool. The research question for Study Three is:

*RQ4: How to operationalize sustainability considerations?*

The outcomes of these three studies will be both a process, which explores how to design contextualized SA tools, and an artifact. This artifact should be able to assess the sustainability of the business models developed in Code: Re-farm. In the following chapters, this process is described in more detail.

## 2. Study One: Contextualizing SA

### 2.1 Introduction

SA is a relatively young paradigm, and is therefore characterized by a certain nebulousness (Hugé et al., 2013). This nebulousness can also be described as ‘constructive ambiguity’. An example of constructive ambiguity is given by Hugé et al. (2013) in which the authors explain that even though many stakeholders are working together towards the same broad objectives, many interpretations of these objectives may co-exist. A precise definition of these broad objectives is not desirable, as this undoubtedly will exclude the views of those whose interests are not included in the definition. Hugé et al. (2013) give an example of constructive ambiguity within the field of sustainable development in which it is widely accepted that the climate crisis will have a devastating impact on our world. However, there is no agreement on how society should respond to this crisis. This disagreement makes steering sustainable development even more challenging.

As a response to this ambiguity Waas et al. (2014) argue that SA should be operationalized within a specific socio-environmental context. This argumentation poses two challenges. First, given the contested nature of sustainability, it is expected that experts are not in agreement over the appropriate framework for assessing sustainability. However, the development of a sector-specific SA framework falls beyond the scope of this thesis. Therefore, the literature on SA in the agricultural sector will be studied to ascertain the key elements of a sustainability framework. Second, as SA is a relatively new field, and is said to be in the beginning stage of its development, there is no scientific consensus on how to achieve this operationalization. Authors who have evaluated SA tools in the agriculture sector will be studied on their perspective on SA operationalization, to shed light on their insights regarding operationalization of SA. Therefore, how to operationalize an SA framework in an agricultural context will be studied in this chapter. The two research questions are:

*RQ1: What is a suitable framework to study sustainability in the context of agricultural farming systems?*

*RQ2: How to operationalize this framework to assess sustainability in agricultural farming systems?*

### 2.2 Method

The objective of literature review is to find papers that reflect on the development process and sustainability framing of existing SA tools and methodologies. To arrive at a representative set of literature on sustainability assessment in the agriculture sector, the database of Scopus was used to retrieve papers. The following three search terms were used: “*sustainability assessment framework*” AND *agriculture*, “*sustainability assessment tool\**” AND *agriculture*, and “*sustainability assessment method*” AND *agriculture*. Scopus looked for these search terms in the titles, keywords, and abstracts of papers. These search terms found papers based on whether they presented a framework, tools, or

method in the context of sustainability assessment. It did not show papers that use the terms frameworks, tools, or methods in the context of the study itself.

In total, the search terms resulted in a total of 75 hits. After deleting double values 71 papers were left, with the first paper being published in 2010, and the most recent paper published in 2022. To remove noise from this set, the titles of these hits were analyzed based on whether the paper was written in the context of the agriculture sector. Four papers were characterized as miscellaneous, papers that were not directly relevant to this review but do sketch the context (assessing assessment tools). Six papers were concerned with indicator selection for SA, these papers were kept for reference but not included in the review. Papers not written in the context of the agriculture sector were removed from the sample (papers on assessing Chinese cities, environmental awareness of university students, or SA of production systems where the agricultural sector is part of). A total of 32 papers discussed specific methods for SA, for example, Life Cycle Analysis (LCA), systems dynamics, or participatory methodologies for SA. These papers were removed from the set, as these papers focused on the application of SA tools and did not reflect on the development processes and sustainability framing of existing tools. A final set of n=12 papers is found in Table 1. As these papers are a good representation of the conceptualization of sustainability as a reflexive and continuous process, no additional papers were included.

**Table 1**

*Papers reviewing agricultural SA frameworks, methods, and tools.*

<b>Reference</b>	<b>Main Focus</b>
<b>de Olde et al. (2016)</b>	Comparison of SA frameworks on normative, systemic, and procedural aspects, and their relevance to Swedish farmers.
<b>Slätmo et al. (2017)</b>	Framing of sustainability in agriculture SA frameworks.
<b>De Olde et al. (2018)</b>	Translating farm-level sustainability assessments into action.
<b>Eichler et al. (2018)</b>	Review of agricultural approaches for sustainability assessment.
<b>Janker &amp; Mann (2018)</b>	Analysis of social dimension in farm-related sustainability tools.
<b>Röös et al. (2019)</b>	Identification of social sustainability aspects for Swedish farmers and proposal of a new method for social sustainability assessments.

<b>Reference</b>	<b>Main Focus</b>
<b>Coteur et al. (2020)</b>	How sustainability assessment tools support end-users strategic decision-making.
<b>Whitehead et al. (2020)</b>	Critical success factors, barriers, and lessons learned for sustainability tools.
<b>Arulnathan et al. (2020)</b>	Evaluation of farm-level decision support tools for sustainability assessments.
<b>Mathijs (2021)</b>	Sustainability performance of food quality schemes and discussion of challenges in sustainability assessment frameworks.
<b>Chopin et al. (2021)</b>	Review of farm sustainability assessment tools and recommendation of temporal dynamic assessments and stakeholder involvement in framing sustainability and designing indicators, and adoption of more complex sustainability framings dealing with emerging systems.
<b>Alaoui et al. (2022)</b>	Analysis of available frameworks for assessing agricultural sustainability and identification of criteria for selecting appropriate frameworks.

### **2.2.1 Data analysis**

The following section undertakes analysis, evaluation, and summarization of the papers presented in table 1. In the analysis phase, each paper was scrutinized for key concepts and findings concerning SA in agriculture. Following the analysis phase, an evaluation of the findings was conducted, to assess the relevance to the research question. This evaluation entailed a thorough examination of the extent to which the findings contributed to the broader discourse on SA in agriculture and the implications for framing and operationalization of SA. Subsequently, the distilled essence of these papers was summarized, highlighting their core themes, perspectives, and implications. The first research question aimed to understand what an appropriate sustainability framing was, this became a theme in the literature review. The second research question was aimed at understanding how to operationalize this framework. In total, four themes were found for operationalization of the framework. The outcomes are discussed in this section.

## **2.4 Results**

### **2.4.1 Sustainability framework for agricultural contexts**

*Sustainability framing.* Little attention is directed towards the conceptualization of sustainability in SA tools, and how this conceptualization impact agriculture (Slätmo et al., 2017). It is however crucial to be explicit in the selections of sustainability conceptualization for tool



developers, because developing a tool comes with power to steer what is emphasized and what is omitted. The most used conceptualization of sustainability in agriculture is a framework in which the sustainability dimensions of economic sustainability, environmental sustainability, and social sustainability are analyzed separately (Alaoui et al., 2022; Arulnathan et al., 2020; Chopin et al., 2021). However, between the reviewed papers, disagreement on the relevance of these dimensions arose. Some studies emphasize compliance to these dimensions (Alaoui et al., 2022), while others focus on the guiding vision of the Bellagio STAMP (Arulnathan et al., 2020). Contrasting these two studies shows that no agreement exists on the dimensions on an appropriate framework in the evaluation of SA tools. However, most SA tools in agriculture, maintain solely an environmental perspective (Mathijs, 2021). These authors demonstrate that within SA literature, there is no consensus on an appropriate framing of sustainability. However, Chopin et al. (2021) studied sustainability framings in SA tools for agricultural sustainability and found 62% of SA studies used the classical view of sustainability – incorporating economic, social, and environmental dimensions. Even though no consensus on an appropriate SA framework exists within the academic literature, this study adopts a multi-dimensional sustainability framework. This choice is rooted in the recognition that this approach offers a comprehensive and inclusive conceptualization, thereby reducing the likelihood of overlooking relevant issues.

*Sustainability dimensions.* To study sustainability of farming systems and their externalities, a broader sustainability framing is recommended. In this study, the sustainability framework that will be used is the governance-oriented framework on sustainability, defining sustainability as an interplay economic, social, environmental, and institutional dimensions (Chopin et al., 2021). This addition of institutional sustainability is added to understand the larger institutional context of the farm and study the externalities of the farming system. To expand on the sustainability framework, the authors propose to study the system properties: viability, resilience, and stability. The inclusion of system properties in the sustainability framework, allows the study of externalities of the farming system. In addition, this will give insight in how to improve the strength of the system when faced with disturbances. Both integration of institutional sustainability and the system properties in the sustainability framing with which sustainability is assessed will better represent externalities of the farming system and provide a systemic overview of the farming system.

#### **2.4.2 A multi-stakeholder approach**

*Adaptation to local contexts.* Adopting a multi-actor, transdisciplinary approach to SA is found to improve ease of use, increase the relevance of results, and increase motivations for participating in sustainable development (Alaoui et al., 2022; Chopin et al., 2021; de Olde et al., 2018; Eichler et al., 2018). Eichler et al. (2018) encourage the involvement of stakeholders in a

collaborative process in which assessment goals are developed in a participatory manner for a specific farming system. Additionally, this collaborative process may be beneficial when stakeholders are asked to provide feedback to improve ease of use. Conversely, top-down assessment approaches may even be harmful to the relevance of a specific SA tool, as sustainability aspects of a more subjective nature might not be captured properly by experts (Röös et al., 2019) and top-down assessment lowers the relevance of results in local contexts (Chopin et al., 2021). To increase the relevance of the results, especially for farm-level assessments, participatory SA approaches are recommended, as this offers insights into local complexity (Chopin et al., 2021). While the participatory approaches suffer from indicator inconsistency, preventing cross-system and cross-region comparisons, this limitation may not significantly affect the outcomes of SA if indicators can be quantified and their applicability extends over time or across similar contexts (Röös et al., 2019). De Olde et al. (2018) find there is a discrepancy between SA tools and their ability to address diversity in farming contexts. These authors argue that participation is a necessary condition to encourage learning, contribute to a feeling of problem-ownership, and development of a shared understanding of the sustainability challenges. In addition, the integration of motivations to engage in sustainable transformations in SA tools is found to be a crucial precursor for fostering sustainable development. A multi-actor, participatory approach is thus crucial for SA in agriculture. However, despite its importance, limited reporting on stakeholder engagement processes within SA tools (Arulnathan et al., 2020). This limited reporting may indicate either the absence of stakeholder engagement or just signal stakeholder engagement is not reported on.

*Managerial support.* Management is an important stakeholder in ensuring the adoption of the SA tool within farming systems. Whitehead et al. (2020) studied the adoption of sustainability tools and their outcomes. The authors found stakeholder involvement alone is not sufficient for tool adoption. Instead, industry commitment was found to be the leading factor in tool adoption, as stakeholders need a clear benefit to engage in sustainability assessment. In addition, the support by leaders in the industry was a clear indicator of the successful implementation of the outcomes of SA. These findings indicate the need for a broader range of stakeholder inclusion, beyond just farmers.

*Political dimension.* Multi-actor involvement is not only relevant for adaptation to local contexts and ensuring the adoption and implementation of outcomes, but it also uncovers a political dimension in sustainability assessment that needs to be addressed (Mathijs, 2021; Slätmo et al., 2017). In current SA tools, an exploration or even acknowledgment of power relations present within these tools is likely to be overlooked. However, acknowledging these power relations are crucial as “*sustainability is a highly contested notion and use of indicator-based frameworks to assess farm sustainability is an expression of power by the developers of the framework and the expert performing the assessment over the farmer*” (Slätmo et al., 2017, p. 391). Awareness of this power is crucial to have to ensure the

development of a fair assessment process. The authors encourage embracing ambiguity within the sustainability concept. This ambiguity about sustainability may lead to building bridges between different understandings of sustainability. However, the authors do warrant a word of caution, as failing openness and willingness to listen may lead to further skewed power relations. Mathijs (2021) finds that as many steps in the supply chain are integrated, extra attention should be paid to a fair distribution of value, especially in the context of unfair competition. Therefore, in the field of SA tool development exists a necessity to study decision-making power within farming systems. This inquiry aims to promote an assessment process which is sensitive to a fair distribution of value.

*Operationalization of sustainability dimensions in collaboration with stakeholders.* Stakeholder involvement is not only important for the adaptation of the tool for local context, it is expected to improve the operationalization of specific sustainability dimensions (Janker & Mann, 2020). Agreement remains problematic regarding the definition and operationalization of social sustainability within existing SA tools, as there is no comprehensive social science framework that is able to provide clarity on the theoretical underpinning of social sustainability (Janker & Mann, 2020). Providing such a framework is outside the scope of this thesis. In the absence of a validated theoretical framework on social sustainability, Janker & Mann (2020) suggest operationalization of the social dimension should happen context-dependent and locally embedded. Rööös et al. (2019) assessed three SA tools and found a discrepancy between the assessment of social sustainability in the SA tools, and the relevance for farmers. The authors found two reasons for this discrepancy. First, tools fail to capture relevant social sustainability aspects within a local context. Second, social aspects present in the SA tools were irrelevant within a local context. To overcome this discrepancy, the authors suggest targeted stakeholder engagement in designing context-specific indicators. However, to contribute to the usability of the indicators, indicators need to be quantifiable and to a certain extent generalizable, at least over time or across similar contexts (Rööös et al., 2019). Although this research was done in the context of social sustainability, the outcomes may be relevant for other dimensions of sustainability. Therefore, stakeholder engagement should be encouraged in the operationalization of sustainability.

*Value judgment.* Tool developers should be explicit in their value judgment and give stakeholders space to express their value judgment. Incorporation of stakeholders' value-judgment into the SA tool will influence the perceived relevance of the tool (de Olde et al., 2016). In addition, aligning value judgment expressed in SA tools with the value judgment of users was this found to increase acceptance and application of results (de Olde et al., 2016). These results have also been found by Alaoui et al. (2022), who found that if the tool expressed a certain value, for example, organic farming is more sustainable than non-organic farming, the results are likely to be considered irrelevant if the users of the tool do not share this value-judgment.

### 2.4.3 Synergies and trade-offs

*Systemic perspective.* The integration of a systemic perspective in SA tools will allow for a more holistic view of the synergies and trade-offs present in sustainability challenges. Eichler et al. (2018) recommend SA tools to have a perspective on sustainability beyond the boundaries of a farm or field. It is recognized by the authors that sustainability cannot be assessed as a single dimension, as they acknowledge SA should assess sustainability as a function of sustainability goals, landscape elements, and indicators that may affect agricultural systems. SA should therefore also assess whether this interplay of components may result in synergies or trade-offs. Moreover, a systemic perspective on SA is expected to positively contribute to the decision-making process as knowledge exchange – and thereby trust – between stakeholder groups within the system is facilitated. In addition, the authors argue that “*assessment frameworks with capabilities to consider broad-scale patterns and processes can support progress toward more sustainable agricultural landscapes*” (Eichler et al., 2018, p. 2). This shows the importance of choosing appropriate boundaries within SA, as keeping boundaries too narrow may lead to underreporting of externalities. However, in their evaluation of SA frameworks, Arulnathan et al. (2020) found transparency in reporting on system boundaries is still limited within many SA tools. Therefore, there is a necessity to choose system boundaries that shed light on these broad-scale patterns and processes and to understand the synergies and trade-offs within an agricultural system.

*System boundaries.* The system boundaries in existing SA tools are limited by their perspective that solely focuses on the agricultural phase of the food system, according to Mathijs (2021). The current food system is characterized by the interdependence of the steps in the supply chain, which are currently not studied as such. Solely focusing on farming practices “*carries the risk of diverting attention from structural changes needed in the food production chain and within the wider society to facilitate agriculture to change its production methods*” (Slätmo et al., 2017, p. 390). Therefore, SA scholars should increasingly study the food system as a whole (Mathijs, 2021), although no recommendations are provided on what ‘the whole system’ means in practice. It is however noted that chosen system boundaries may also impact the outcomes of the SA, therefore extra attention should be given to choosing appropriate system boundaries.

*Exploring externalities.* A systemic approach is essential when assessing sustainability. What makes this systemic perspective so powerful, is the ability to develop considerations about possible trade-offs and synergies in collaboration with stakeholders. Eichler et al. (2018) consider interactions across multiple farm systems by deploying a participatory stakeholder approach, which results in the identification of synergies and trade-offs. Slätmo et al. (2017) express the necessity of acknowledging conflicting goals. In their analysis of sustainability framings within SA tools, the authors found many SA tools do not acknowledge the possibility of trade-offs, but only discuss synergies. (p. 386-387). It

is expected operationalization of trade-offs and externalities can be done most efficiently and holistically in collaboration with stakeholders by identifying how management choices may affect the farming system.

#### **2.4.4 Sustainability is a continuous process**

*Reflexivity.* Sustainability should be viewed as a process that can be continuously steered, in light of new challenges. Viewing sustainability as a reflexive, continuous process is more productive than considering it as a fixed end goal (Slätmo et al., 2017). This process framing of sustainability advocates for sustainability as a starting point for dialogue, and the process behind it requires an ability to compromise. Reflexivity can answer questions about agenda-setting and exploring who has the right to decide what sustainability in the agriculture sector looks like (Slätmo et al., 2017). In addition, reflexivity can acknowledge conflicting perspectives. Furthermore, reflexivity aims to understand why something is unsustainable, on a larger scale than the farm level. In the context of agricultural sustainability, SA tools should be used as the basis for dialogue, rather than being solely regarded as a recipe for change.

*Dynamic assessment process.* When SA allows for repeated measurements, progress can be monitored over time (Arulnathan et al., 2020). In addition, these authors found that SA tools get updated regularly with better data and better models. There is however one drawback, as Arulnathan et al. (2020) did not study if and how indicators get updated, whether the definitions of sustainability get updated, or if the process gets updated. Dynamic assessment processes are expected to solve this shortcoming. Dynamic assessment processes improve over time due to regular stakeholder input, updating indicator values, and learning about rates of adoption of improved practices (Eichler et al., 2018). In addition, dynamic assessment process facilitating knowledge-exchange are likely to increase awareness of how actions affect the farming system. Therefore, dynamic assessment processes should regularly update indicators, repeat measurements over time, and facilitate knowledge exchange.

#### **2.4.5 Goal setting**

*The capacity of stakeholders to influence decision-making.* Existing SA tools often lack the necessary support for effective decision-making (Coteur et al., 2020). More than half of the tools the authors analyzed did not offer support for the interpretation and implementation of the results. It is, however, crucial SA tools can support end-users act towards sustainable development. Future SA tools should therefore focus on closing the gap between the use of an assessment tool, the implementation of strategies, and the monitoring and benchmarking of sustainability performance (Coteur et al., 2020).

*Sustainability objectives.* De Olde et al. (2018) studied SA tools from an agricultural perspective and found that ex-post SA tools dominate the field. These types of tools mainly serve two functions: as input for decision-making or certification. Myriad tools for decision-making exist, all with different perspectives and perspectives on how to assess sustainability. Due to this diversity, the tool used for SA influences the results and therefore sustainability-based decision-making. The other type of tool, SA for certification, seems to imply that positive outcomes guarantee sustainability. De Olde et al. (2018) argue that these SA tools are not enough for catalyzing change in the sector. To overcome this challenge, the authors call for a new vision of SA, a vision that can consider diversity in both sustainability objectives and in the context in which the tool is used. Eichler et al. (2018) address this need for contextualization and recognition of the integration of diverse sustainability objectives in SA. The authors recommend a system-based framework for SA, which can assess the landscape of a farming system, rather than focusing on a single product or farm. This type of framework would reflect the perspectives of all stakeholders in the system. A starting point of each SA tool or process should therefore be interactions with stakeholders in which landscape goals are defined. By implementing a cyclical assessment procedure, the landscape goals are updated continuously.

## 2.5 Conclusions

The objective of this literature review was twofold, the first objective was to find a framework to study sustainability in the agriculture sector. The second objective was to understand how operationalize this framework within an agricultural context.

*RQ1: What is a suitable framework to study sustainability in the context of agricultural farming systems?*

*RQ2: How to operationalize this framework to assess sustainability in agricultural farming systems?*

The conceptualization and operationalization of sustainability remain a point of contention within the academic community. However, this literature review presents multiple methods to deal with conflicting ideas on conceptualization and operationalization of sustainability. First, the minimum requirement for the development of an SA tool that aims to study farming systems, is that sustainability framework should assess economic, social, environmental, and institutional sustainability dimensions. While the most common conceptualization of sustainability was the classical view – economic, social, and environmental – a broader framing of sustainability is recommended to study farming systems and their externalities. In addition to the sustainability framework and its dimensions, farming systems should be assessed on whether they are able to achieve sustainability goals, based on the resilience, viability, and stability of the system. Studying these elements will shed light on system properties, illuminating how the farming system and its environment interact.

Second, according to the results, the operationalization of the sustainability framework should emphasize a multi-actor approach, acknowledge synergies and trade-offs, define sustainability as a continuous process, and allow stakeholders to steer sustainability. Stakeholder involvement and a multi-actor approach are crucial to develop SA tools which capture sustainability challenges adequately and increase implementation of outcomes of the assessment. However, there is no agreement on how which methods to use to engage stakeholders in the SA development process. Except for managerial stakeholders, no explanation is given on who to include as a stakeholder. Tool developers should be aware of their political power and the possibility of enforcing skewed power relations. Not only should tool developers include stakeholders for goal development, but also for operationalization of sustainability indicators, where value judgment may be expressed and integrated in the operationalization.

The operationalization of the sustainability framework can be improved by acknowledging synergies and trade-offs through the systemic dimension. A SA tool first needs to express the intention to study the food system through a systemic perspective, instead of placing the boundaries of the assessment at farm-level. In addition, the SA tool needs to be explicit in the choice of system boundaries. By identifying the system boundaries, the ability arises to explore externalities – synergies and trade-offs – in collaboration with the actors in the system. These three steps necessary for acknowledging synergies and trade-offs are crucial to assess the farming system holistically and acknowledging system-wide implications.

Multiple authors acknowledge the necessity for SA tools to acknowledge the ‘wicked’ characterization of sustainability. This wickedness cannot be solved in advance; however, it can be dealt with on a process-level. It should be acknowledged by SA tool developers that sustainability is not a static concept and is subject to many interpretations, and these interpretations are subject to change both on a temporal and spatial level. This interpretation of sustainability as a wicked, dynamic concept, can be addressed by integrating reflexivity and the continuous improvement of the assessment process and tool.

The final guideline for operationalization to recognize a diverse set of sustainability objectives, to shift the objective of SA from assessing a situation to catalyzing change. Within SA, often the focus lies solely on assessing the current situation. However, as SA is input for decision-making, all stakeholders in the farming systems should be able to update sustainability goals. This process of updating goals should not be carried out once, but the continuous updating of goals should be integrated SA itself.

## 3. Study Two: Sustainability Considerations

### 3.1 Introduction

The sustainability framework and its dimensions found in Study One need to be operationalized in the specific context of Code: Re-farm. The first step in operationalizing this framework is to identify sustainability considerations that are currently important in farming systems. Sustainability considerations are certain conditions, concerns, or aspirations that encompass sustainability issues that merit attention in the specific context (Gibson, 2016). These considerations are found by following the steps for operationalization of the framework, as obtained by the results of Study 1. A multi-stakeholder approach, the explicit establishment of synergies and trade-offs between dimensions, continuous updating and monitoring of goals, and the establishment of goals for the transformation of the sector give meaning to the sustainability framework. The second step of the operationalization of the sustainability framework and its dimensions, is the specification of sustainability criteria, based on the sustainability considerations found in this study. This will be done in Study Three. As found in Study One, the criteria on which sustainability is going to be assessed need to be tailored to the specific context. This Study Two will therefore focus on how to elicit the main considerations for sustainability in the goat and poultry value chains.

*RQ3: What are the main sustainability considerations that should be acknowledged and acted upon within the poultry and goat value chains in Code: Re-farm?*

### 3.2 Method

The method for Study Two is informed by the results from Study One. Study One found that multi-stakeholder approaches for developing SA tools are crucial. Contextualization of SA should be rooted in a multi-stakeholder approach, especially in an agricultural context where expert-driven SA inadequately captures the subjective nature of aspects of sustainability and lowers the relevance of the results. Study One also emphasizes SA should acknowledge trade-offs and synergies in the context of the sustainability dimensions. Additionally, goal-setting initiatives in collaboration with stakeholders are encouraged. These results informed the type of research, data collection, and data analysis in Study 2.

To address the research question, data on sustainability conditions, sustainability concerns, and expected outcomes are needed. However, the analyzed literature in Study One did not provide clear guidance on the implementation of a multi-stakeholder approach in the development of an SA tool. Therefore, the main method to elicit the sustainability considerations was through the utilization of interviews. Furthermore, it is recommended to supplement the interview data with additional information concerning context considerations, for example drawing from policy documents or other reports (Gibson, 2016). Therefore, both data from interviews, as well as policy documents and reports



were used for the specification of sustainability considerations.

Due to the international context of Code: Re-farm, online interviews were chosen as the main method to elicit sustainability considerations, after which these considerations can be translated into sustainability criteria. In these interview sessions, the main objective is to uncover the main sustainability considerations for the stakeholders and partners in Code: Re-farm. To uncover these considerations, questions were split up into two parts: construction of the sustainability considerations for the sustainability dimensions, trade-offs and synergies, and goal setting, as found in Study One. The sustainability framing used to structure these interviews is based on the governance-oriented view of sustainability (Chopin et al., 2021; Slåtmo et al., 2017) as the farming systems in Code: Re-farm is embedded in certain institutional dimensions, which (partly) inform how these farming systems are governed. A template was developed to structure the interviews (Figure 2), the interview questions can be found in Appendix A.

In addition to the sustainability framing in the academic literature on sustainability assessment, Code: Re-farm's specific focus is on how animal welfare and intensive versus extensive agriculture are impacting sustainable production and the quality of products. Therefore, in this assessment of sustainability, these criteria should be considered in the development of the SA tool. Within the semi-structured interviews, the participants were asked about the sustainability impact on the farming systems of extensive versus intensive agriculture, as well as the impact of animal welfare. These criteria are not visually presented in the interview template since these are secondary to the chosen sustainability dimensions. In addition, as tool developers have the power to direct how sustainability is framed, it was a precautionary decision not to visualize extensive and intensive farming systems and animal welfare as sustainability dimensions. This choice was made to keep the discussion as open as possible and to not frame sustainability through the contrast between intensive versus extensive agriculture, or animal welfare.

The consulted literature on sustainability assessment is not explicit in what is considered an appropriate timeframe for constructing the relevant sustainability considerations. However, considering the potential impact of a new European Parliament on sustainability frameworks within the business models design space, a timeframe of five years has been selected. This timeframe may be subject to change if it proves inappropriate.

**Figure 2**

*Interview template*



### **3.2.1 Selection of participants**

To understand which sustainability considerations are important for the goat and poultry value chains, first relevant stakeholders need to be selected. The process for stakeholder selection was informed by the democracy cube (Fung, 2006). The democracy cube is a framework that explores the facilitation of participation in complex governance. To facilitate participation, one main concern is: who gets to participate? Within the participant selection dimension of the democracy cube five selection mechanisms are identified: self-selection, selective recruitment, random selection, lay stakeholders, and professional stakeholders. These mechanisms can be represented on a scale, ranging from inclusivity to exclusivity, respectively. Within this thesis, the choice was made to selectively recruit participants. This selection method has the advantage that participants who are less likely to engage, or whose voices are not often heard, can be recruited for participation (Fung, 2006). In addition, the stakeholders who have a special interest in a certain decision-making process may be invited for participation, to ensure a broad range of sustainability perspectives are present in the SA tool. Within farming systems, it is essential to capture the vision of sustainability of those who will be most impacted by the assessment, instead of only recognizing the perspective of those with the greatest political power (Slåtmo et al., 2017). Therefore, the participants were selectively recruited.

In this thesis, a distinction was made between the context and content to guide participant selection. First, the context will be explained. In Code: Re-farm, the unit of analysis for sustainability assessment is the imagined, future business models. Therefore, to elicit the sustainability considerations for new business models for Code: Re-farms' farming systems, stakeholders from the

business model design space (BMDS) were interviewed. Five dimensions of the business models design space have been identified: cultural, political, user & market, industry, and science & technology (Wesseling et al., 2020). These dimensions will be especially relevant in the context of the business models of Code: Re-farm, as they have been designed in the context of future regime drivers. These stakeholders can provide an overview of the existing sustainability considerations in the specific dimensions of the business model design space. Therefore, stakeholders from the business models design space will be interviewed to construct the sustainability considerations.

Secondly, it is important to invite stakeholders with relevant knowledge about the content of the goat and poultry value chains. By inviting stakeholders with expertise in either goat or poultry husbandry systems, it will be ensured that the content applies to the goat and poultry value chains. In addition, it was ensured that both chain partners' and farmers' perspectives on sustainability were taken into account.

### **3.2.2 Selection of (policy) documents**

To enhance the contextualization of sustainability considerations, it is recommended method to include policy documents that set out concerns and priorities with the specific assessment context (Gibson, 2016). In addition to the project partners, another main stakeholder of Code: Re-farm is the European Union. The European Union has both funded this project to address societal challenges and provides the regulative framework in which Code: Re-farm is rooted. This framework is the Farm-to-Fork strategy and sets out how the European Union can achieve “*fair, healthy and environmentally-friendly food systems*” (European Union, 2020, p. 1). The Farm-to-Fork strategy, therefore, informs the broader context for sustainability assessment as the food systems in Code: Re-farm fall under the Farm-to-Fork strategy. To develop the sustainability goals for the SA tool, the Farm-to-Fork strategy will be used along with the interviews to construct a holistic view of sustainability.

As Farm-to-Fork is a strategy, this means that this policy document focuses on goal setting for farming systems. The content of this particular policy paper is too broad to be used for the construction of sustainability considerations, as it does not specifically focus on sustainability within goat and poultry value chains. However, the policy document is included in the goal-setting phase of the analysis because it indicates the institutional context in which food systems will be developed in the EU over the next number of years.

In addition, one Code: Re-farm deliverable was obtained in which the consumer-driven demands for the products in these farming systems were studied (Gerevini et al., 2021). This study shed light on cultural values and the translation of these values into consumer demands. This document will provide insight into sustainability considerations of the consumers of products produced by the goat and poultry value chains.

### **3.2.3 Data analysis**

In total, eight stakeholders responded positively to the invitation to participate in an interview

on sustainability criteria. A total of six interviews were conducted. Amongst these stakeholders, all five dimensions of the business model design space methodology were represented. This representation was made possible by stakeholders' expertise in various aspects of the food system. i.e., one stakeholder had knowledge of both the political dimension, as well as the industry perspective on sustainability. While other stakeholders could give insights into science & technology combined with information about users & markets. In addition, there was a fair division between stakeholders with expertise on goat farming systems, and stakeholders with expertise on poultry farming systems.

The interviews were transcribed and analyzed based on the aforementioned sustainability dimensions, goals, synergies, and trade-offs. For the transcription of the interviews, software by Microsoft Teams was used. Before the content of the transcript could be analyzed, the transcript needed to be cleaned. To clean the data, the audio recording and transcript were compared, transcript mistakes were corrected, and filler words and timestamps were removed. In addition, the data was fully anonymized. Transcripts of the interviews can be found in Appendix B.

Data from both the interviews as well as the documents were analyzed. Data from the Farm-to-Fork strategy exclusively contributed to the formulation of the sustainability goals. The method for analysis was thematic coding in which the initial codes were based on the themes of economic, institutional, environmental, and social sustainability. Furthermore, synergies and trade-offs were identified, as well as sustainability goals centered on resilience, viability, and stability. These codes were further refined into subthemes. These themes and subthemes were then iterated upon in collaboration with another researcher with expertise in goat and poultry value chains to ensure the themes were coherent and reflected what was discussed in the interviews. After this iterative step, the subthemes were then named and given their definition.

## **3.4 Results**

### **3.4.1 Economic sustainability**

To further explore the concept of sustainability, the economic sustainability criteria are first analyzed. Since different stakeholders were asked to explore these different sustainability criteria, a deeper understanding is gained of how economic sustainability is conceptualized by the stakeholders. The economic sustainability criteria can be found in Table 2.

*Technological innovations for animal health.* Technological innovations monitor the health of animals in real-time farmers. Monitoring animal health allows farmers to keep costs down, due to rapid intervention when animals fall ill. This rapid intervention leads to lower veterinarian bills. In addition, when illness is treated quickly, animals recover sooner and return to production sooner. The health of animals is also expected to improve the quality of products. Therefore, high standards for animal health and having monitoring technologies in place result in improved economic sustainability for

farmers.

*“When you recognize the disease in this subclinical phase [...]it is much easier to treat it and cure it even without antibiotics so. And the process of recovery is shorter for the animal. And [...] for economic sustainability, that animal is treated faster and recovery is faster, so it can be back in production sooner.” (Interview 1)*

*Financial wellbeing.* Financial wellbeing is found to be of crucial importance for the farmers within the farming systems. This well-being needs to be prioritized in how the margin is distributed amongst chain actors and in policy formulation. Moreover, both farmers and the food industry need to be able to profit from added value. The three main criteria are a fair margin, financial security, and value capture for sustainability.

- Fair margin. A fair margin is of crucial importance for farmers to stay in business, according to the interviewees. The margin should be distributed fairly amongst chain actors.
- Policy for financial security. Farmers should be able to recoup investments in technologies that were mandated by the government. Likewise, regulations within the European Union are equal within all of Europe. This equal playing field is necessary for fair competition within Europe.

*“[Economic sustainability] that's fair margin distribution, isn't it? If you see the percentage of [get what]. That's not always fair distribution” (Interview 2)*

*“I think that the government can also contribute through legislation and regulations, because, for example, some farmers have bought emission-reducing machines [...], in the hope that they can then keep their current stock, their current number of animals. At first, that would be allowed with certain machines, so then they made an expensive investment and later it turned out that it wasn't enough.” (Interview 3)*

*Local production and consumption.* The value chain is resilient against external shocks to protect the farming systems against rising prices. Wars, climate degradation, or scarcity of raw materials may impact the economic sustainability of farming systems. Producing in a shorter chain is expected to improve resilience, however, this requires local production and consumption of food.

*“The war has a big impact on prices and farmers, I think maybe we should [...] produce more in the Netherlands, [...] in a smaller chain” (Interview 3)*

*Viability.* The products from goat and poultry farming are competitive in the market. The three criteria for improving viability are signaling product quality, product safety, and valorization.

- Quality and sustainability indicators. Indicators are often used to signal the product's quality to consumers. The existence of clear and understandable quality markers is crucial for farmers

and companies to remain competitive in the market and steer purchasing decisions of consumers.

- Innovative value propositions. Sustainability requirements are high on the agenda of consumers and other societal actors. New value-capture mechanisms for sustainability should be developed, facilitating farming and the food industry to profit when their products are environmentally sustainable.

*“the main advantage for the company is the communication of sustainability to the consumer in order to utilize or to have new clients or to increase the [loyalty] of the old clients.” (Interview 5)*

*“And then it is also important that they not only get paid for producing food but also for the other services they provide [...]. So if, for example [...] you provide a service that contributes to the improvement of nature [...] then you should get paid for that.” (Interview 3)*

**Table 2**

*Economic sustainability considerations*

<b>Consideration</b>
Technological innovations for animal health
Financial wellbeing <ul style="list-style-type: none"> <li>• Fair margin</li> <li>• Financial security</li> <li>• Financial growth</li> </ul>
Local production and consumption
Viability <ul style="list-style-type: none"> <li>• Quality and sustainability indicators</li> <li>• Innovative value propositions</li> </ul>

**3.4.2 Institutional sustainability**

Institutional sustainability was found to be a crucial component in the farming systems studied in Code: Re-farm. Special attention was paid to policy development for this sector. In addition, emphasis was placed on knowledge production within this sector and how it can contribute to the development of more sustainable farming systems. An additional finding was that these mechanisms for knowledge production allow various stakeholders in the farming system to exert influence on the development of sustainable farming systems, where this was previously not possible. The institutional sustainability criteria are discussed in more detail below, the results can be found in Table 3.

*Feasibility policies.* The implementation of policies is currently not being properly checked on its applicability. In addition, guidance is needed from governments and knowledge institutes on how to implement these policies.

- Feasibility check. Currently, the feasibility of outcomes is not properly checked, both on the level of EU policies and national policies. This omission of a feasibility check leads to friction within the farming systems, as farmers are confronted with new regulations that are difficult to adhere to.
- Guidance. In addition to the friction between regulation and implementation, farmers are often not guided on how to implement policies. There exists a need to help farmers through transitions with the help of experts and to translate policies to certain contexts.

*“Animal welfare organizations [ask for better policies]. Then policymakers who don't really understand the practice incorporate that into laws and regulations. That then has to go through the Parliament. Where, if all goes well, feasibility is looked at. And if that doesn't happen? Yes, then something like that is adopted, and it then comes back to ministry employees who have to make sure that it is implemented. And then they find out that it is not feasible.”* (Interview 3)

*“That in such a transition farmers may then also be better [and] we have advisors [that can say]: if you buy this, then you may certainly apply that as well.”* (Interview 3)

*Collaborative decision-making.* Powerful institutions drive sustainability transitions in the sector. NGOs, banks, the government, and feed companies have a strong influence on the sustainable development of farming systems. The interviewees indicate there needs to be clarity of roles for these stakeholders, and visions amongst all the stakeholders need to be aligned to steer transitions sustainably. Therefore, emphasis is placed on collaborative decision-making processes, in which powerful institutions and other actors in the farming system make collaborative decisions on how to create more sustainable farming systems.

*“We need to understand that this whole idea of people sitting at the top and then giving instructions to the rest of them down below is very problematic because they have no actual understanding in many cases and any actual view of what is happening on site. So, the only reason the only way to move forward and change these institutional barriers, because I think they're barriers is to include all the different people, co-create solutions together with the people that are actually going to implement.”* (Interview 4)

*Agility and experimentation.* In current transition processes, little emphasis is placed on learning from previous experiences. Agility needs to be encouraged in the transition towards more sustainable farming systems. The transition to more sustainable farming systems is expected to be facilitated by process-based learning. Experimentation should be encouraged, and mistakes are used as input for

learning processes. These learning processes result in lessons learned, and these lessons are used in practice for the development of sustainable farming systems.

*“Yes. I think more agility as well, having the decency in many cases to say that yes, that was wrong we need to do it again. Let's do another round. Instead of having this idea that whatever the regulations and the institutions and the academics and whatever, everything they tell you is that actually 100% correct all the time, which is not.” (Interview 4)*

**Table 3**

*Institutional sustainability consideration*

<b>Feasibility policies</b>
<ul style="list-style-type: none"> <li>• <b>Feasibility check</b></li> <li>• <b>(Political) guidance</b></li> </ul>
<b>Collaborative decision-making</b>
<b>Agility and experimentation</b>

### 3.4.3 Environmental sustainability

Environmental sustainability was conceptualized by the stakeholders as preventing harm to the environment and reduction of antibiotic use. In addition, stakeholders indicated how consumers, the market, and companies play a role in improving environmental sustainability. These elements informed the main sustainability considerations, a summary can be found in Table 4.

*Prevent harm to the environment.* One of the main challenges in environmental sustainability is how to prevent harm to the environment. Three main prevention methods were found, the reduction of emissions, waste reduction, and land exhaustion.

- **Emission reduction.** Product innovation can entail end-of-pipeline technologies, which are highly debated whether they can achieve what they pretend. On the other hand, emissions need to be averted at the source, so emissions are not produced in the first place. Both methods are expected to reduce emissions in the goat and poultry farming systems.
- **Waste reduction.** Companies acknowledge wasteful behavior and aim to reduce the use of resources and find ways to capitalize on waste streams.
- **Land exhaustion.** Farmers aim to stop the exhaustion of the land and be able to leave the land the way it was found. An important note that was made by an interviewee is that some regions are specialized in certain methods of production and stopping processes that are polluting may cause extensive pollution in regions that are not specialized in those production processes. This trade-off should be carefully monitored. In addition, processes that have a positive impact on the environment cost a lot of time or effort, which may be why these



processes aren't used as often. These processes should be encouraged.

*“You have emission-reducing technologies, those innovations, they've all been burned to the ground again because almost all of them were criticized that they don't live up to what they claim at all. [...] But that's end of pipeline isn't it, so can you capture the emissions at the end? But of course it's even better if you can address the source.” (Interview 2)*

*Antibiotic use.* The poultry sector uses little to no antibiotics, and no information on antibiotic use in the goat sector was given. However, innovation in sensors for monitoring animals will allow the goat sector to reduce its use of antibiotics. These sensors can only be applied in extensive farming settings.

*“When you recognize the disease in this subclinical phase, as I said, it is much easier to treat it and cure it even without antibiotics.” (Interview 1)*

*Innovative sustainability standards.* Companies and research institutes aim to anticipate the sustainability concerns of consumers, for whom environmental sustainability is high on the agenda. This leads to the development of innovative sustainability standards, not imposed by legislation, but rather embraced voluntarily by companies to align with the growing demands for environmental sustainability from consumers.

*“we are working to a new sustainable standard that is related to reducing [...] the involuntary emission of microplastics in the environment. [...] we are trying to figure out some guidelines for the food companies to give them the possibility to produce in a better way, in order to reduce the emission of microplastics in the environment.” (Interview 5)*

#### **Table 4**

##### *Economic sustainability considerations*

---

##### **Prevent harm to the environment**

- **Emission reduction**
- **Waste reduction**
- **Land exhaustion**

---

##### **Antibiotic use**

---

##### **Innovative sustainability standards**

---

#### **3.4.4 Social sustainability**

Social sustainability in this context was framed in three ways: animal welfare, farmer welfare, and food security. Stakeholders mentioned how each of the social sustainability elements could be improved upon, Table 5 shows the social sustainability considerations.

### *Animal welfare.*

- Animal characteristics. Animals have specific characteristics that make them more robust to changes in food, changes in weather conditions (due to climate change) and can be happy in the conditions in which it is grown. This robustness leads to animals that are able to adapt to changing circumstances.
- Animal well-being. Animals are being kept according to the highest welfare standards. Both in collaboration with technology developers and scientific experts that study the impact of well-being on the other sustainability dimensions, sustainability standards for animal well-being are developed.

### *Farmer welfare.*

- Social communities in a local ecosystem. Farmers are part of a local ecosystem and social network. Livability for the farmers and their neighborhood is of high concern, and connection with consumers is crucial. A sense of community and belonging in these local ecosystems is crucial to keep people healthy.
- Media. Consumers have access to see what is happening on a farm, either via (social) media or farm visits. Farms and farmers have been negatively represented in the media. Stakeholders expect farmers can take back control of their image by opening their farms to visitors, and/or actively achieve better representation of themselves in the media.

*“But also the social [sustainability] for the farmers themselves. They are of course in a social network who contribute their own things; not just producing food, but they have all kinds of roles in social structures. Well in the countryside especially.” (Interview 3)*

*Food security.* The cost of living in Europe has increased. Sustainably produced products are often sold at a premium price, making them less affordable for the average consumer. One note was made that eating fewer animal products would be helpful in this regard, but it would not contribute to the sustainability of goat and poultry value chains. The stakeholders indicated there is a delicate balance between sustainable innovation and food security for consumers.

*“I believe, especially when it comes to farming and the products, [...] is the cost and the cost of living in general. With the increased cost of living a lot fewer people are willing to pay the price of the animal products” (Interview 4)*

**Table 5***Social sustainability considerations*


---

<b>Animal welfare</b>
<ul style="list-style-type: none"> <li>• <b>Animal characteristics</b></li> <li>• <b>Well-being</b></li> </ul>
<b>Farmer welfare</b>
<ul style="list-style-type: none"> <li>• <b>Social communities in a local ecosystem</b></li> <li>• <b>Media</b></li> </ul>
<b>Food security</b>

---

**3.4.5 Synergies and tradeoffs**

In addition to the understanding of the sustainability consideration in a vacuum, it was found in Study One sustainability should also be understood from a systemic perspective, which can be done by identifying synergies and trade-offs. However, during the analysis of the interviews, it was revealed that the results indicate that the synergies and trade-offs could be characterized as correlations rather than trade-offs. For the environmental-economic dimension, participants mentioned that sustainable production methods are often less efficient production methods. In addition, the prevention of harm to the environment by farmers was expected to increase farmer value capture mechanisms. As a correlation in the institutional-economic dimension, the correlation between policy checks and financial security for farmers was discussed. The correlation between the institutional dimension and the environmental dimension was discussed in terms of feasibility checks and policy for financial security, as the policies from the European Union need to be tailor-made to local areas to work. The social-economic dimensions concerned the correlation between animal health and the improved quality of food which would result in a better margin. In the social-environmental dimension, a correlation was discussed between the sustainability demands of society, which farmers are in touch with through media usage, and the role of these demands in improving the sustainability of products. The correlation between social and institutional dimensions concerned a government that supports and guides farmers through the transitions, which will lead to stronger social communities and more trust.

**3.4.6 Sustainability Goals: system requirements**

In the reviewed papers from Study One, a clear conceptual difference was made between the sustainability goals of resilience, viability, and stability. In practice, however, the distinction between these three concepts was not clear-cut, as these sustainability goals were also often found as a theme within sustainability considerations. This distinction between sustainability considerations and

sustainability goals could not be as clearly defined in this empirical analysis as it was in the literature. In addition, participants often mentioned that sustainability goals could correlate with one another. These correlations made the process of goal development more difficult for participants. However, even though this process proved difficult, the sustainability goals are discussed below.

To improve the resilience of the farming system against external shocks, participants proposed to make production chains smaller and increase the self-sufficiency of farmers. Especially considering the financial crisis, this was expected to mitigate the impact that a financial crisis may have on farmers. Producing in a smaller chain makes local production systems more vulnerable if for example, crops fail. In case of events that may disrupt the supply of resources necessary for production, the chain should be able to deal with the shortfall in resources. A backup of resources should be in place, and in addition, the different value chains are producing a high diversity of resources that are able to address the shortfall. To optimize sustainable production methods and increase collaboration between chain actors to allocate resources more efficiently, collaboration between the farming communities should be facilitated.

The second element of goal setting is the viability of the value chain. The main concern that was expressed when discussing system viability was the generation of fair economic returns for the supply chain. However, participants were not in agreement on how to generate fair economic returns. Some participants mentioned farmers having diversity in revenue models, while others identified ensuring product quality as a key component to viability. There was also disagreement on the necessity for farmers to be independent of external finances. Some participants identified financial schemes to be integral to farm viability, while other participants mentioned that being dependent on external money was a sign of a system that is not financially viable. Overall, little consensus was found on how to work toward viability.

The final element of goal setting was stability. What was discussed as the main goal was food security. To make sure everybody has access to food, the self-sufficiency of farmers was mentioned. This self-sufficiency was also mentioned as an important element for improving resilience. In addition, food security was also looked at from a governmental perspective. Participants noted the necessity of acknowledging the food chain as a critical infrastructure. However, the food chain is currently not yet identified as a critical infrastructure.

The elements discussed in goal setting had a clear link to the sustainability dimensions. All of the goals were previously defined in the sustainability considerations. Therefore, the choice was made not to integrate the sustainability goals that already have been discussed in the sustainability considerations. The sustainability goals for the sector will be the self-sufficiency of farmers, an increase in the backup of resources, and acknowledgment of the food chain as a critical infrastructure. In addition, no distinction will be made between goals for resilience, viability, or stability, as the participants did not see the added value in making this distinction, and a lot of overlap was found between the goals.

### 3.4.7 Requirements Code: Re-farm

In addition to the sustainability dimensions, specific questions were asked regarding the goals of Code: Re-farm. Both the sustainability of intensive versus extensive farming, as well as animal welfare were addressed in the interviews, as these considerations constitute a large part of the institutional context in which these farming systems are present. Even though the institutional contexts, the EU, and research organizations, emphasize that extensive agriculture is a crucial element for the sustainability of these farming systems, within both academic communities and the farming community, the sustainability of extensive agriculture remains a point of contention. In contrast to the

One of the main objectives of Code: Re-farm is to understand the role of intensive and extensive farming systems in sustainable production. Therefore, special attention was given to the expected impact of intensive and extensive farming systems on sustainability within the goat and poultry value chains. There is an academic debate on whether extensive farming systems are sustainable. Oftentimes, intensive farming systems are characterized as more sustainable, because more animals can be kept on a smaller amount of land, resulting in a high output of products. However, intensive farming comes with the cost that it undervalues the wellbeing of animals being kept in these systems. Within these interviews, the view that intensive farming is more sustainable was questioned. New research was discussed that is being done on the sustainability of extensive farming systems. The preliminary result of this research indicates that extensive farming systems with a focus on animal welfare may also be considered environmentally sustainable. Another point of attention brought forward by these interviews was that certain sensors for monitoring animal welfare were only possible to implement in extensive farming systems. Within this sustainability assessment, no recommendations can be made regarding the sustainability of intensive versus extensive farming systems. This acknowledgment is in line with the literature on sustainability assessment in agricultural farming systems, which proposes sustainability is depended on its broader context and cannot be defined beforehand. Therefore, the sustainability of intensive versus extensive farming systems cannot be defined beforehand.

In addition to the environmental sustainability of farming systems, extensive agriculture is expected to positively contribute to social sustainability. Mainly for two reasons, the first reason being that extensive agriculture can contribute to landscape development, in which farmers and their neighbors have an improved quality of living due to better living standards. The second reason is that extensive farming systems try to connect to consumers. Connecting farmers and consumers is expected to close the gaps between urban and rural areas, thereby improving social sustainability.

*"In the past, of course, there were also 10 times as many farmers, now there are far fewer with more animals. So, there are also just fewer farmers and it's all a bit more industrial. By no means [are all farmers industrial], because of course we have those extensive [husbandry systems] that this research in Code: Re-farm is also about. But anyway, [...] in fact you often*

*see that with those extensive husbandry systems as well, yes, those also do a lot more to make that commitment to consumers." (Interview 2)*

In addition to studying the impact of the two farming systems on sustainable production, the role of animal welfare on product quality is studied. Animal welfare is found to be essential to the sustainability of the goat and poultry value chains. A sustainability consideration often mentioned is that animal welfare should be a goal by itself, instead of only giving importance to animal welfare because it may impact product quality. In three out of four sustainability dimensions, animal welfare was mentioned as a specific sustainability criterium. Environmental sustainability, economic sustainability, and social sustainability all emphasized the necessity of animal welfare.

*"They always say if you keep the animals to the highest welfare standards then it comes at the expense of sustainability. Because you have different [crops], different stocking rates and so on. I believe by now the science on that is that it is best to have all the caveats that you can still produce to the highest standards, that you actually have at the bottom the same efficiency, CO2 footprint and so on." (Interview 2)*

### **3.5 Conclusions**

This study has concerned itself with the identification of sustainability considerations and system goals for the goat and poultry value chain. To understand sustainability in the context of business models for goat and poultry value chain, the research question was as follows:

*RQ3: What are the main sustainability considerations that should be acknowledged and acted upon within the poultry and goat value chains in Code: Re-farm?*

First, the main sustainability considerations were identified, which can be found in Tables 2 to 5. In addition, the objective of this research was to identify synergies and trade-offs. However, this did not work out, as during the analysis it was found that what were supposed to be synergies and trade-offs were correlations. The reason for identifying synergies and trade-offs was to gain an understanding of how sustainability dimensions may affect sustainability in other dimensions. However, this analysis provided little insight into which considerations may be at odds with each other, or how they might reinforce each other. Another finding was that the sustainability considerations and sustainability goals had too many commonalities to study them as separate entities. The sustainability goals encompass the self-sufficiency of farmers, an increase in the backup of resources, and acknowledgment of the food chain as a critical infrastructure. Regarding the objectives of Code: Re-farm, no clarity was found on the impact of intensive versus extensive farming systems on sustainable production. In contrast, animal welfare was found to be of importance for sustainability.

## 4. Study Three: SA tool

### 4.1 Introduction

In Study Two, the main sustainability considerations for this sector were elicited by interviewing stakeholders within the business model context of goat and poultry value chains. This Study builds on the results of Study Two, aiming to translate the sustainability considerations into quantifiable metrics which can be used to develop the SA tool. Indicators are often used for measuring sustainability. These indicators often represent a reference value, described as “*a goal, a target, a norm, a standard, or a benchmark*” (Waas et al., 2014, p. 5520). In the context of a reflexive conceptualization of sustainability, indicators would need to be continuously updated in light of new information. Reference values would make it possible to assess farming systems based on the distance between the current and predicted value of an attribute (Waas et al., 2014). However, the business models that need to be assessed are the result of futuring methodologies, which means these business models often do not exist, with some exceptions aside. Therefore, a reference value can often not be obtained, making indicator development a challenging process. Therefore, the research question for study Three: SA tool is:

*RQ4: How to operationalize sustainability considerations?*

### 4.2 Method

One of the ambitions of a reflexive approach to sustainability assessment is that criteria and goals can be easily updated (Voß et al., 2006). Hence, the process for operationalization needs to be straightforward and uncomplicated. Even though this process may not be as precise and robust as methodologies for indicator development, this does not have to represent a problematic concern. Gibson (2016) indicates that indicators with high precision are not always necessary, as more precision is not expected to deliver greater advantages. Instead, the focus should be on the development of criteria that are able to assess sustainability within a specific context, which is also reflected in the outcomes of Study One. If criteria are developed based on contextual considerations, the resulting criteria are often superior to information that already exists (Gibson, 2016). Steering the focus away from precision and robustness has the added value that criteria can be described in such a way that they are easy to understand, which makes it possible for the general public to judge these criteria and give feedback on how to improve them (Gibson, 2016). This improvement is crucial regarding the reflexive approach this research has taken. If, in later iterations of the tool, the feedback of the general public needs to be solicited to adapt or transform criteria, the public needs to be able to grasp the meaning of the criteria. This Study will therefore concern itself with the operationalization of sustainability considerations into sustainability criteria, and the validation and evaluation of the subsequent sustainability criteria.

### **4.2.1 Tool development**

Sustainability criteria are the specification of sustainability considerations (Gibson, 2016). How the specific criteria are framed depends on the underlying sustainability considerations. Combining stakeholder-driven and expert-driven approaches is strongly recommended for the development of sustainability criteria (Waas et al., 2014). In Study Two the development of sustainability considerations was stakeholder-driven. In this study, the operationalization of the considerations was expert-driven, thereby combining the two methodologies of operationalization. An initial set of criteria was developed by the main researcher based on sustainability considerations found in Study Two. The specification of considerations was done by framing desirable outcomes as criteria that promote protection and enhancement (Gibson, 2016). Undesirable considerations were framed as criteria that encourage repair, reform, or transformation. Framing the considerations in this way, resulted in the initial list of sustainability criteria.

This set of criteria was further refined in a codesign session, drawing upon the insights of two domain experts. Collaboration with these experts, one specializing in SA, and another with expertise in goat and poultry value chains, served a dual purpose. First, is codesign session provides a refined understanding of the sustainability considerations embedded within the criteria. Any perceived vagueness was addressed in this phase, which ensured clarity and precision of the criteria. The second objective was the operationalization of the criteria. This provided a refinement of the framing of the sustainability criteria and established their operationalization. For instance, the criterium for animal welfare found its basis in EU regulation (European Commission, n.d.), the other criteria were operationalized through expert consensus due to limited data availability. For the operationalization of the criteria, a 5-point Likert scale was employed, utilizing frequency or extent scales. This scale, ranging from 1 ('never' or 'not at all') to 5 ('always' or 'extremely'), facilitated the quantification of responses. In addition to the criteria for the sustainability considerations, criteria for the sustainability goals were developed. Subsequently, these criteria were integrated into an Excel-based tool, which provided a dual purpose. Firstly, the tool provides a structured framework for users to assess business models based on sustainability criteria. Secondly, the tool offers the ability to visualize the outcomes, enabling comparison of the sustainability across the business models. The first iteration of the tool can be found in Appendix C. By combining expert insight, rigorous operationalization, and the subsequent development of an artifact, this approach provides the foundation for the subsequent phases of evaluation and validation.

### **4.2.2 Evaluation and Validation**

The evaluation and validation of the SA tool encompassed two objectives: assessing the usefulness of the artifact and assessment of the validity of the criteria, respectively. Two developers of Code: Reform's future business models tested the first iteration of the tool by assessing existing business models for the poultry egg value chain. One assessment was done online, and one in person at the



Technische Universiteit Eindhoven (TU/e). The evaluation and validation phase employed a qualitative approach, as the objective was to elicit feedback on the usefulness and validity. Usefulness was assessed by the ability of the tool to visually compare sustainability between business models. The validity of the criteria was assessed on whether were: Relevant, Accepted, Credible, Easy to monitor, and Robust (RACER). This RACER principle offers meta-criteria for the assessment of the validity of the criteria (European Commission, 2017). The assessment of the validity was done by eliciting feedback during the first application of the SA tool. Both the results from the evaluation and validation provided input for the development of the second iteration of the tool.

## 4.3 Analysis

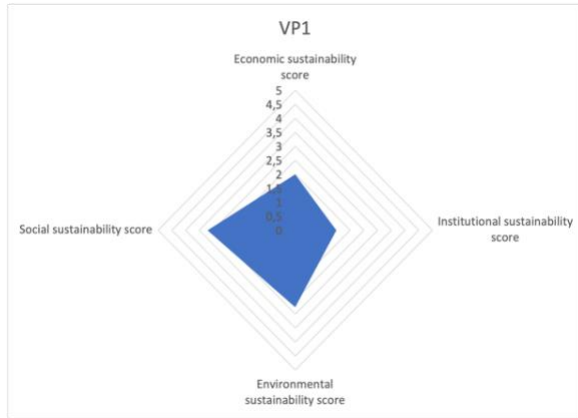
### 4.3.1 Evaluation

The evaluation of the SA demonstrates the tool's ability to discern differences in sustainability between existing business models. This evaluation encompassed the analysis of the assessment outcomes. These assessment outcomes of the first two business models are depicted in Figures 3 to 6. The assessment results of the additional 3 business models can be found in Appendix D. The evaluation conducted by the first researcher is represented by the blue graph, while the evaluation carried out by the second researcher is depicted in the yellow graph. Each figure corresponds to one business model and visualizes its assessment across the four sustainability dimensions. These visualizations demonstrate the tool's capacity to discern variations in sustainability amongst the business models. For example, in Figure 3 the blue area is noticeably larger than the blue area in Figure 5. This difference indicates the business model in Figure 3 demonstrates a higher degree of sustainability when assessed on the established sustainability criteria. Moreover, the tool enables more detailed comparisons between individual sustainability dimensions. The precision in dimension-specific evaluations demonstrates the capacity of the tool to facilitate nuanced assessment. The result of this initial evaluation demonstrates the tool's efficacy in assessing and comparing business models' sustainability in the poultry egg value chain.

A limitation of this tool becomes evident when comparing the researchers' assessment results side-by-side. Comparing Figures 3 and 5, representing the assessment conducted by Researcher 1, and Figures 4 and 6, representing the assessment performed by Researcher 2 reveals distinct differences between evaluation results. This divergence can be attributed to two factors: the interpretation of criteria and the interpretation of business models. These differences in interpretation resulted in observable disparities in the assessment outcomes. This observation demonstrates the limitation of individual assessment.

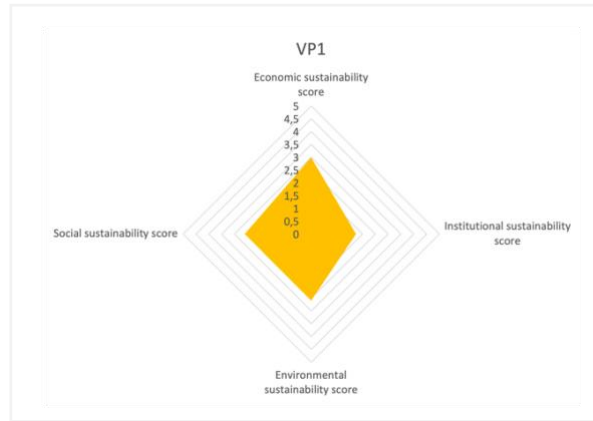
**Figure 3**

*Sustainability assessment results business model 1, assessment by Researcher 1*



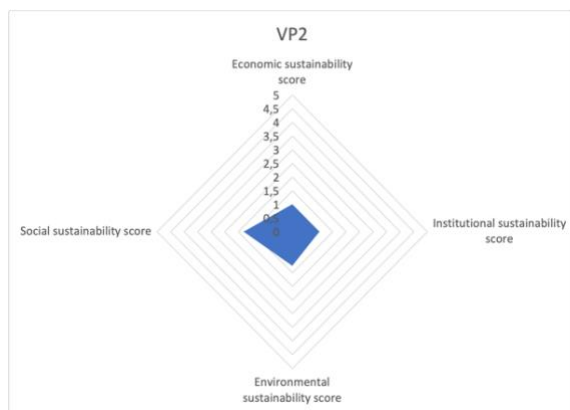
**Figure 4**

*Sustainability assessment results business model 1, assessment by Researcher 2*



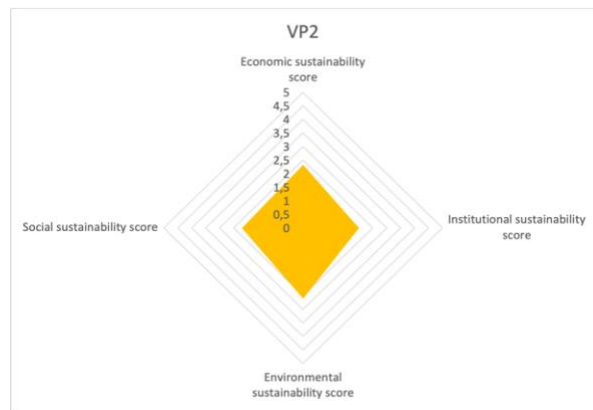
**Figure 5**

*Sustainability assessment results business model 2, assessment by Researcher 1*



**Figure 6**

*Sustainability assessment results business model 2, assessment by Researcher 2*



### 4.3.2 Validation

The validation process, guided by the RACER criteria, unveiled which criteria warrant refinement and how to improve these criteria. The first meta-criterion is the “relevance” of the criteria for the task at hand. This criterion aims to assess whether the criteria are a clear measure of the objective the tool aims to accomplish. The goal of the SA tool is to assess business models based on their differences in sustainability. Most criteria effectively contributed to this assessment, however, the criteria assessing sustainability from a regulatory context exhibited limitations when used to differentiate business models. Upon further examination, this limitation could be attributed to the assessment of the current business models instead of the future business models. Existing business

models are all subject to the same regulatory frameworks. It is expected that for future business models, more distinctions can be made due to substantial changes in the context of the business models. In addition, two criteria were deemed less relevant for the poultry-egg sector: land exhaustion and antibiotic use. After close inspection, these criteria did not properly capture the essence of the sustainability considerations. A revision of these criteria is imperative to ensure an accurate representation of the considerations. The final observation regarding the relevance of the criteria pertains to the applicability of the sustainability goals. These goal-based criteria were deemed irrelevant since they were universally applicable across all business models, thereby failing to offer additional value in the context of SA. The second RACER-criterion is “acceptance”, acceptance indicates the sustainability criteria are accepted by relevant stakeholders and have a clearly defined role. The criteria that were farmer-focused, were regarded as less acceptable for the task at hand, as not all existing business models have an explicit a farmer-focus. The acceptance of these farmer-focused criteria was therefore lower. The lower acceptance of these farmer-focused criteria prompted a recommendation to reframe these criteria within a business-model context. The third meta-criterion is “credible”, which aims to assess whether the criterium provides unambiguous information. Both researchers generally agreed that the criteria provide a cohesive overview of the sustainability considerations perceived by stakeholders in the sector. The fourth meta-criterion was “easy”, which indicates the data necessary to assess the criteria is easy to obtain and/or available. Both researchers indicated that the assessment should be a collective task, due to the limited availability of data. As discussed previously, data is not readily available. This makes collaborative assessment essential, as it fosters discussion about the interpretation of the criterium and how it should be assessed in the absence of assessment data. The final meta-criterion is “robust”, which states the indicator is grounded in solid theory, resistant to manipulation, prevents double counting and omissions, and relies on reasonable assumptions. This relates to the methodology used to construct the criteria, which was not discussed. However, due to the reflexive methodology used in this thesis, ensuring the criteria are continuously updated in a reflexive and continuous process will ensure these criteria’s robustness. Overall, iteration is needed on the farmer-focused criteria, land exhaustion, and antibiotic use. In addition, sustainability goal criteria should be rewritten so these criteria improve assessment. And ensure a collaborative assessment process.

## **4.4 Results**

Based on the results of the evaluation of the tool validation of the criteria, a second version of the tool was developed, this version can be found in Table 6. The preliminary evaluation findings indicate the tool is capable of assessing the sustainability of business models and facilitating meaningful comparisons. However, comparing the graphs of the assessment between the business models shows some discrepancies between the assessment results when assessed by distinct individuals. These discrepancies highlight the reflexive nature of SA and the potential for subjectivity

in this process, as even slight nuances in the interpretation of criteria or business models may lead to dissimilar assessment results. This reinforces the notion that SA tools have a role in facilitating comprehensive discussions and thereby promoting a holistic understanding of sustainability amongst stakeholders involved in the SA process. This collaborative approach in SA is necessary for achieving credible and consistent assessment outcomes. To summarize, the evaluation has demonstrated that this SA tool adds value to the assessment process, not only as an analytical instrument; it advocates for meaningful engagement in the assessment process, which fosters a shared understanding of sustainability.

The validation unveiled which criteria needed further refinement. The main concern was redeveloping the criteria on land exhaustion and antibiotic use. The criterium for land exhaustion was rewritten in the context of feed production for livestock. The criterium concerning antibiotic use was expanded to encompass technology capable of illness prevention, which thereby lowers the need for medication. In addition, farmer-focused criteria were expanded to encompass a wider value chain perspective, after checking this did not change the intended meaning of the sustainability considerations. The criteria that were rewritten are: “fair margin”, “policy-making for financial security”, “local production and consumption”, “guidance”, “emission reduction”, “social communities in a local ecosystem”, and “media”.

**Table 6**

*Sustainability criteria for SA tool*

<b>Sustainability dimension</b>	<b>Theme</b>	<b>Criterium</b>
<b>Economic sustainability</b>	Technological innovation for animal health	To which extent are sensors being implemented and used in stables to monitor animal welfare?
	Fair margin	To which extent do the actors in the value chain receive a fair margin?
	Policy-making for financial security	To what extent do the policies in place provide a reliable and predictable environment for stakeholders to recoup the efforts and resources they have dedicated to sustainability initiatives?
	Local production and consumption	To what extent has the value chain reduced its reliance on external resources while ensuring the production of critical inputs during periods of demand?

<b>Sustainability dimension</b>	<b>Theme</b>	<b>Criterion</b>
	Quality and sustainability indicators	To which extent do clear and understandable labels exist that food companies and farmers can put on their product to signal to consumers their product is of high quality and produced sustainably?
<b>Institutional sustainability</b>	Innovative value capture mechanisms	To which extent is the additional value that the product provides factored into the price of a product?
	Feasibility check	To which extent are feasibility checks part of the policy-making process?
	Guidance	To which extent are governments offering assistance to the actors in the value chain to implement policies?
	Collaborative decision-making for sustainability	To which extent do the actors in the value chain feel they can exert influence on the decision-making process regarding the sustainable development of the value chain?
	Agility and experimentation	To which extent do companies and knowledge institutions have the opportunity to learn from past experiences without immediately discontinuing projects if something fails?
<b>Environmental sustainability</b>	Emission reduction	To which extent have measures been taken to reduce or prevent emissions in the value chain?
	Waste reduction	To which extent have measures been taken to reduce or prevent waste by the actors in the value chain?
	Land exhaustion	To which do the feed production processes for livestock help in mitigating or averting land degradation?
	Antibiotic use	To which extent are alternative technologies being used to help prevent illness in animals, thereby lowering the need for additional medication?

<b>Sustainability dimension</b>	<b>Theme</b>	<b>Criterion</b>
	Innovative sustainability standards	To which extent do companies develop and make use of voluntary sustainability standards that exceed existing sustainability standards?
<b>Social sustainability criteria</b>	Animal characteristics	To which extent are the animals that are being kept resilient to change?
	Social communities in a local ecosystem	To which extent are products or services produced in extensive farming systems?
	Media	To what extent is media being used to improve contact between consumers and the actors in the value chain?
	Food security	To what extent are the products produced in the value chain affordable for the average consumer?

## 4.4 Conclusion

This study has concerned itself with the operationalization of sustainability considerations. The research question was:

*RQ4: How to operationalize sustainability considerations?*

To operationalize the sustainability considerations, sustainability criteria were developed. This choice was made due to the fact limited data is available to construct robust and reliable indicators. An expert-driven approach to criteria development was chosen, and Likert scales on a scale from 1 to 5, 1 ('never' or 'not at all') to 5 ('always' or 'extremely'), were used to measure the extent to which the criteria were met. Quantifying the criteria gave insights into sustainability scores, and graphs facilitated visual comparison of business model sustainability.

It is crucial to note however that the criteria remain a reflection of how sustainability is currently conceptualized. Operationalization provides additional insight into how criteria are used to paint a picture of reality. This tool reflects the context and content of the farming systems and what is currently considered important. There is a strong possibility that this tool may lose its value in the future, but that is precisely the intention, as it is assumed the meaning of sustainability changes over

time either due to sustainability goals that are reached and have therefore become superfluous or as the interpretation of sustainability has changed due to new externalities that arose. Therefore, continual assessment of the tool's relevance as well as the updating of criteria to capture changes in ideas about sustainability is necessary.

Divergence in SA outcomes existed among individual users of the tool. Some elements of the business models were interpreted differently by the researchers who filled in the tool, resulting in a different sustainability score for business models. Additionally, researchers noted that the tool's capacity to stimulate discussion contributed to its value. These observations indicate the necessity of collaborative assessment.

## 5. Conclusions

This study was concerned with developing a sustainability assessment tool for alternative business models, which are tailored to the context of goat and poultry value chains. In this thesis, SA was conceptualized as a reflexive process to deal with wicked sustainability problems. Throughout this thesis, the necessity of this reflexivity was emphasized.

A design science research approach proved a suitable methodology for the development of this tool and for bridging the gap between theory and the real world. Study One facilitated an exploration of the existing landscape of SA tools within the agriculture sector. This exploration resulted in the identification of a suitable framework to study sustainability in this sector. Furthermore, Study One provided input on the transformation of the abstract concept of sustainability into a useful artifact. The implementation of a multi-stakeholder approach, acknowledgment of synergies and trade-offs, continuous updating of the tool, and goal setting were crucial for developing an artifact based on the sustainability framing. The results from Study One provided input for the development of sustainability considerations. By integrating insights from interviews and (policy) documents a comprehensive picture of sustainability considerations concerning economic, institutional, environmental, and sustainability for the goat and poultry farming systems was developed. Consequently, these sustainability considerations informed the development of sustainability criteria and the SA tool. Study Three concerned the design and validation of the tool. Expert evaluation and validation provided clear information on the design of sustainability criteria and improvement of the tool. This process underlines the significance of employing appropriate methods that enable relevant stakeholders to offer insights on the criteria, which results in enhanced robustness of the final SA tool.

The methods employed in the different studies proved crucial for capturing the contemporary perspectives on sustainability and SA, combining insights from the academic literature, stakeholders in the value chains, and expert opinion. This process affirms the ability of the design science research process to recognize the intricate nature of sustainability as a wicked problem and to build upon various perspectives on sustainability throughout the development of the SA tool. It is recommended to repeat this process of generating sustainability consideration and criteria development, to keep these considerations and criteria up to date. In addition, given the evolving nature of the discourse on sustainability in the academic literature, it becomes imperative to periodically update the input for the interview template and interview process. In conclusion, this thesis has concerned itself with the development of a SA which is change-oriented and guides decision-making toward sustainability in the goat and poultry value chain.



## **6. Discussion**

Within this thesis, the goal was to develop a SA tool for the goat and poultry value chains, while simultaneously acknowledging the wicked character of sustainability. The outcome of this thesis, therefore, is an example of a methodology for developing a SA tool based on a design science approach, and an artifact. This chapter will focus on discussing both the methodology and the artifact.

### **6.1 Validity**

The choice was made to employ a design science approach to close the gap between rigor and relevance. This approach has informed the development of the SA tool. Given that the goal of this thesis was to develop a SA tool contextualized to the goat and poultry value chain, it is important to note that the SA tool itself is not generalizable. The methodology used, however, can be used for the development of other contextualized SA tools. This demonstrates the generalizability of the methodology undertaken in this study.

One concern that potentially can decrease the external validity of the approach taken in this thesis pertains to the population validity. In Study Two, only stakeholders from Code: Re-farm were asked for their sustainability considerations regarding the goat and poultry value chains. Even though the stakeholders were in close contact with other partners in the value chain, no direct information was obtained from other partners. This concern may indicate that the broader applicability of the SA tool outside of Code: Re-farm is limited.

Regarding the internal validity of this research, the use of the interview template allowed for eliciting sustainability considerations through a sustainability framework recommended in the context of SA for agriculture. In addition, consultation with researchers with expertise in the goat and poultry value chains took place to assess the reliability of the sustainability considerations. The stakeholders for the interviews were carefully selected, based on both context and content considerations. The internal validity of Study Three was partly dependent on how well Study Two was performed. If the sustainability considerations were not retrieved using appropriate methods, the criteria in Study Three would also not be valid. As an additional measure to ensure the internal validity of Study Three, the sustainability criteria were developed in a codesign session with two domain experts. This method was applied in order to minimize the subjectivity within the results and counter potential biases.

### **6.2 Results and interpretation**

The results from Study One aligned with the anticipated requirement of a reflexive approach to sustainability, as was set out in the introduction. Additionally, the results provided concrete insights into the contextualization of SA, specifically tailored to the agriculture sector. The findings of Study Two, especially regarding the sustainability considerations, corresponded with the anticipated findings and gave insight into the main sustainability issues in the goat and poultry value chain.

However, results concerning the trade-offs, synergies, and goals, were not as well-defined as expected. This discrepancy may be attributed to the methods chosen to develop these considerations. Individual goal development proved difficult for the interview participants, and further, the goals that were set proved too broad to be used in an assessment context. While goal setting remains a crucial aspect in a reflexive approach to sustainability, the sustainability goals as found in Study Two proved of limited relevance to the SA tool. This because these goals were overarching to the business models, therefore they could not be used to distinguish between business models.

Other methods for goal development should be explored, as well as the integration of goal development in other parts of the SA tool development process. For example, it might be that goal development is better suited in a collaborative context, during the assessment process itself. More clarity on this potential role of goal setting is needed. The result from Study Three was the SA tool itself. After evaluating the tool, it was found that the tool was able to differentiate the business models on their sustainability. The evaluation of the SA tool provided input on the usability of the tool, not only as an analytical assessment tool but also as input for discussion and collaborative assessment. Even though no explicit information was asked on the role of the SA tool in the context of reflexive processes, this feedback regarding the SA tool's potential contribution to collaborative discussion aligns with the reflexive approach to sustainability.

### **6.3 Limitations**

Two limitations in this research were identified regarding the operationalization of the sustainability framework. The first limitation was that within the literature review, no recommendations were given for specific methods for multi-stakeholder involvement, or goal setting. The literature review provided no additional information on when and how to include stakeholders in the SA development process. The choice was made to involve stakeholders and goal development at the beginning of the SA development process through interviews. Even though including stakeholders this early in the process provided a lot of room for exploration of sustainability issues, it did have its limitations as stakeholders oftentimes expressed uncertainty on what is appropriate to include as a sustainability consideration. More information on when and how to include stakeholders is a necessity to ensure sufficient operationalization of the sustainability framework.

The second limitation pertains to the empirical study, specifically regarding the methods used for eliciting the sustainability considerations, trade-offs, and goals. In the literature review, no recommendations were given on how to engage with stakeholders. In the interviews it became clear that especially for the goals and trade-offs, participants had difficulty exploring these themes, oftentimes citing the limitations of their knowledge. Therefore, other methods, for example stakeholder workshops, may be a better suited approach, to collaboratively explore goals and trade-offs. Furthermore, if drafting sustainability considerations is to be an ongoing process, then interviews

and thematic analysis might not be the best approach as it requires expertise and specialized software. Alternatively, methods such as workshops may be more accessible for the continuous development of sustainability considerations.

The third limitation concerned the number of participants in the interviews. In total, eight stakeholders were interviewed. Even though a fair distribution was made in the selection of interview participants concerning the business model design space, additional interviews could have enhanced the depth of the thematic analysis. In addition, reflexive approaches agree on the inclusion of all relevant stakeholders. In this thesis, the business model design space informed the selection of relevant stakeholders. However, stakeholders outside of the business model design space were not represented in this selection. It can be argued that the inclusion of stakeholders who are not directly in the business model design space, but who do experience the impact of the business models, should also be included in the future development of sustainability considerations.

A fourth limitation concerned the inclusion of business model literature. In this thesis, literature on the business model design space was used to inform contextual considerations for SA tool development. The business model literature has not been taken into account to the same extent as the literature on SA tool has been. This became evident in Study Three, during the expert evaluation it was remarked that some sustainability criteria were too farmer-centric. These criteria were evaluated as less relevant for the assessment of the business models that were less farmer-focused. For future development of this SA tool, it is recommended to look at the literature on SA for business models and integrate more specific business model SA elements into the existing tool.

Limitation five pertains to the (self-identified) limits of knowledge of the stakeholders. Stakeholders showed difficulty conceptualizing sustainability dimensions. This demonstrated a clear need for clarity on the theoretical frameworks used, as often these frameworks and corresponding dimensions have a different interpretation, which leads to ambiguity. Even though this ambiguity was accounted for, as the reflexive processes acknowledged the interpretation of these dimensions may be subject to change, most stakeholders were uncomfortable discussing their perspective of sustainability as they thought it would make the research biased. Therefore, more rigorous conceptualizations of sustainability seem warranted. However, a more rigorous conceptualization does not fit within the reflexive conceptualization of sustainability. Contrastingly, the scientific community could work towards the acceptance of this ambiguity and embrace it.

In Study Three, two additional limitations can be acknowledged. The sixth limitation concerns the evaluation of the SA tool. The evaluation was done on current business models in the poultry egg sector, but not on the dairy goat and poultry meat business models. Therefore, no conclusions can be drawn on the usability of the SA tool for the dairy goat and poultry meat value chains. Additional evaluations are necessary to study the effectiveness of the tool for assessing sustainability for dairy goat and poultry meat business models.

The seventh limitation, found in Study Three, pertains to the unit of the analysis of the SA,

which was the current business models instead of the alternative business models. The alternative business models were not developed at the time of writing. Therefore, no conclusions can be drawn on the effectiveness of the SA tool for alternative business models. When the business models are developed, a second expert evaluation should be done.

#### **6.4 Implications**

The implications of this research are twofold. The first implication concerns the use of the SA tool. This SA tool should be acknowledged for its value for collaborative decision-making in the context of SA for business models in the goat and poultry value chains. This tool doesn't aim to provide an objective evaluation of the sustainability of these business models, recognizing that the inherently complex and multifaceted nature of sustainability does not allow for such an assessment to be made. The tool has been developed from the perspective that sustainability involves a multitude of perspectives on sustainability exist and no single objective solution to sustainability challenges can be developed. In contrast, the value of this tool stems from its ability to facilitate collaborative decision-making toward sustainability.

The second implication is a broader implication for the scholarship of SA development. The processes, as informed by a design science research approach, and carried out in the context of SA development, can be applied as an extension of current methodologies focusing on positivist assessment of sustainability. Combining assessment approaches allows for the development of more comprehensive and holistic assessment tools. Thereby, this research contributes to the evolution of SA methodologies, focusing on the development of pragmatic solutions for addressing sustainability challenges.

#### **6.5 Future**

Future research could explore different methods for updating the sustainability considerations and criteria. In this research, the choice was made to develop sustainability considerations through a thematic analysis of both stakeholder interviews and relevant documents. No research has been done on how to refine the sustainability considerations or criteria in light of new information. In this thesis, expert evaluations informed the iteration on the sustainability criteria. Future research should explore methodologies for incorporating a broader spectrum of stakeholders in this process, to ensure the considerations and criteria stay relevant.

Furthermore, future research can explore methods for collaborative decision-making in SA. The expert evaluations indicated the tool's efficacy in steering collaborative decision-making. However, this has not been explicitly integrated into the SA tool. Refinement of the tool design is needed to enable tool users to effectively employ the tool for collaborative decision-making.

## 7. Literature

- Alaoui, A., Barão, L., Ferreira, C. S. S., & Hessel, R. (2022). An Overview of Sustainability Assessment Frameworks in Agriculture. *Land*, *11*(4), 537. <https://doi.org/10.3390/land11040537>
- Arulnathan, V., Heidari, M. D., Doyon, M., Li, E., & Pelletier, N. (2020). Farm-level decision support tools: A review of methodological choices and their consistency with principles of sustainability assessment. *Journal of Cleaner Production*, *256*, 120410. <https://doi.org/10.1016/j.jclepro.2020.120410>
- Beers, P. J., Turner, J. A., Rijswijk, K., Williams, T., Barnard, T., & Beechener, S. (2019). Learning or evaluating? Towards a negotiation-of-meaning approach to learning in transition governance. *Technological Forecasting and Social Change*, *145*, 229–239. <https://doi.org/10.1016/j.techfore.2018.09.016>
- Binder, C. R., Feola, G., & Steinberger, J. K. (2010). Considering the normative, systemic and procedural dimensions in indicator-based sustainability assessments in agriculture. *Environmental Impact Assessment Review*, *30*(2), 71–81. <https://doi.org/10.1016/j.eiar.2009.06.002>
- Chopin, P., Mubaya, C. P., Descheemaeker, K., Öborn, I., & Bergkvist, G. (2021). Avenues for improving farming sustainability assessment with upgraded tools, sustainability framing and indicators. A review. *Agronomy for Sustainable Development*, *41*(2). <https://doi.org/10.1007/s13593-021-00674-3>
- Coteur, I., Wustenberghs, H., Debruyne, L., Lauwers, L., & Marchand, F. (2020). How do current sustainability assessment tools support farmers' strategic decision making? *Ecological Indicators*, *114*, 106298. <https://doi.org/10.1016/j.ecolind.2020.106298>
- de Bruijn, H., van Duin, R., Huijbregts, M. A. J., Guinee, J. B., Gorree, M., Heijungs, R., Huppes, G., Kleijn, R., de Koning, A., van Oers, L., Wegener Sleeswijk, A., Suh, S., & Udo de Haes, H. A. (2002). Main characteristics of LCA. In H. de Bruijn, R. van Duin, M. A. J. Huijbregts, J. B. Guinee, M. Gorree, R. Heijungs, G. Huppes, R. Kleijn, A. de Koning, L. van Oers, A. Wegener Sleeswijk, S. Suh, & H. A. Udo de Haes (Eds.), *Handbook on Life Cycle Assessment: Operational Guide to the ISO Standards* (pp. 5–10). Springer Netherlands. [https://doi.org/10.1007/0-306-48055-7\\_2](https://doi.org/10.1007/0-306-48055-7_2)
- de Olde, E. M., Sautier, M., & Whitehead, J. (2018). Comprehensiveness or implementation: Challenges in translating farm-level sustainability assessments into action for sustainable development. *Ecological Indicators*, *85*, 1107–1112. Scopus. <https://doi.org/10.1016/j.ecolind.2017.11.058>
- Dijk, M., de Kraker, J., van Zeijl-Rozema, A., van Lente, H., Beumer, C., Beemsterboer, S., & Valkering, P. (2017). Sustainability assessment as problem structuring: Three typical ways. *Sustainability Science*, *12*(2), 305–317. <https://doi.org/10.1007/s11625-016-0417-x>
- Eichler, S., Lopez-Ridaura, S., Kline, K., Gerard, B., Gardeazabal, A., Govaerts, B., & Dale, V. (2018). Assessing sustainability in agricultural landscapes: A review of approaches<sup>1,2</sup>. *Environmental Reviews*, *26*, 1–17. <https://doi.org/10.1139/er-2017-0058>
- European Commission. (n.d.). *Animal welfare*. Retrieved August 7, 2023, from

[https://food.ec.europa.eu/animals/animal-welfare\\_en](https://food.ec.europa.eu/animals/animal-welfare_en)

- European Commission. (2017). *Improving the monitoring indicators system to support DG Competition's future policy assessments: Final report*. European Commission.  
<https://data.europa.eu/doi/10.2763/1790>
- European Union. (2020). *Farm to Fork Strategy*.
- Fung, A. (2006). Varieties of Participation in Complex Governance. *Public Administration Review*, 66(s1), 66–75. <https://doi.org/10.1111/j.1540-6210.2006.00667.x>
- Gerevini, M., Palermo, M., De Vito, M., Demosthenous, P., Giusti, A., Smits, A.-J., Gelasakis, T., & Anastasi, M. (2021). *Stakeholders requirements report (2.1)*. TCA.
- Gibson, R. (Ed.). (2016). *Sustainability Assessment: Applications and opportunities* (1st ed.). Routledge.  
<https://doi.org/10.4324/9781315754048>
- Hubeau, M., Marchand, F., Coteur, I., Mondelaers, K., Debruyne, L., & Van Huylenbroeck, G. (2017). A new agri-food systems sustainability approach to identify shared transformation pathways towards sustainability. *Ecological Economics*, 131, 52–63. <https://doi.org/10.1016/j.ecolecon.2016.08.019>
- Hugé, J., Waas, T., Dahdouh-Guebas, F., Koedam, N., & Block, T. (2013). A discourse-analytical perspective on sustainability assessment: Interpreting sustainable development in practice. *Sustainability Science*, 8(2), 187–198. <https://doi.org/10.1007/s11625-012-0184-2>
- Janker, J., & Mann, S. (2020). Understanding the social dimension of sustainability in agriculture: A critical review of sustainability assessment tools. *Environment, Development and Sustainability*, 22(3), 1671–1691. Scopus. <https://doi.org/10.1007/s10668-018-0282-0>
- Keskin, D., & Romme, G. (2020). Mixing Oil with Water: How to Effectively Teach Design Science in Management Education? *BAR - Brazilian Administration Review*, 17(1). <https://doi.org/10.1590/1807-7692bar2020190036>
- Kirkels, A. (2020). *Sustainability indicators*.
- Mathijs, E. (2021). Introduction and Overview of the Special Issue: Challenges to Assessing the Sustainability Performance of Food Quality Schemes. *Journal of Agricultural and Food Industrial Organization*, 19(2). Scopus. <https://doi.org/10.1515/jafio-2019-0036>
- Matthews, N. E., Stamford, L., & Shapira, P. (2019). Aligning sustainability assessment with responsible research and innovation: Towards a framework for Constructive Sustainability Assessment. *Sustainable Production and Consumption*, 20, 58–73. <https://doi.org/10.1016/j.spc.2019.05.002>
- Measures, M. (2013). Rapid Sustainability Analysis. *SOLID News*, 4, 3–4.
- Notarnicola, B., Sala, S., Anton, A., McLaren, S. J., Saouter, E., & Sonesson, U. (2017). The role of life cycle assessment in supporting sustainable agri-food systems: A review of the challenges. *Journal of Cleaner Production*, 140, 399–409. <https://doi.org/10.1016/j.jclepro.2016.06.071>
- Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14(3), 681–695. <https://doi.org/10.1007/s11625-018-0627-5>
- Remkes, J. (2022). *Wat wel kan: Uit de impasse en een aanzet voor perspectief*. Ministerie van Landbouw,

Natuur en Voedselkwaliteit.

- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155–169. <https://doi.org/10.1007/BF01405730>
- Röös, E., Fischer, K., Tidåker, P., & Nordström Källström, H. (2019). How well is farmers' social situation captured by sustainability assessment tools? A Swedish case study. *International Journal of Sustainable Development and World Ecology*, 26(3), 268–281. Scopus. <https://doi.org/10.1080/13504509.2018.1560371>
- Sala, S., Ciuffo, B., & Nijkamp, P. (2015). A systemic framework for sustainability assessment. *Ecological Economics*, 119, 314–325. <https://doi.org/10.1016/j.ecolecon.2015.09.015>
- Slätmo, E., Fischer, K., & Röös, E. (2017). The Framing of Sustainability in Sustainability Assessment Frameworks for Agriculture. *Sociologia Ruralis*, 57(3), 378–395. Scopus. <https://doi.org/10.1111/soru.12156>
- Voß, J.-P., Bauknecht, D., & Kemp, R. (2006). *Reflexive Governance for Sustainable Development*. Edward Elgar Publishing.
- Waas, T., Hugé, J., Block, T., Wright, T., Benitez-Capistros, F., & Verbruggen, A. (2014). Sustainability Assessment and Indicators: Tools in a Decision-Making Strategy for Sustainable Development. *Sustainability*, 6(9), Article 9. <https://doi.org/10.3390/su6095512>
- Waas, T., Hugé, J., Verbruggen, A., & Wright, T. (2011). Sustainable Development: A Bird's Eye View. *Sustainability*, 3(10), Article 10. <https://doi.org/10.3390/su3101637>
- Wesseling, J. H., Bidmon, C., & Bohnsack, R. (2020). Business model design spaces in socio-technical transitions: The case of electric driving in the Netherlands. *Technological Forecasting and Social Change*, 154, 119950. <https://doi.org/10.1016/j.techfore.2020.119950>
- Whitehead, J., MacLeod, C. J., & Campbell, H. (2020). Improving the adoption of agricultural sustainability tools: A comparative analysis. *Ecological Indicators*, 111. Scopus. <https://doi.org/10.1016/j.ecolind.2019.106034>
- Zott, C., & Amit, R. (2013). The business model: A theoretically anchored robust construct for strategic analysis. *Strategic Organization*, 11(4), 403–411. <https://doi.org/10.1177/1476127013510466>

## **Appendix A - Semi-structured interview questions**

### **Sustainability concept**

- What do you consider sustainability to be in the context of goat and poultry farming systems?
- What do you consider to be environmental sustainability?
- What is crucial for social sustainability in the current farming systems?
- What factors contribute to economic sustainability?
- Whose sustainability framing should be considered in the development of the sustainability criteria, which is currently not?
- Looking at the four sustainability framings above, how do you see the interplay between these dimensions?
- What examples within the current farming systems do you consider sustainable practices?
- Where do you think the farming systems can be improved in terms of their sustainability?
- Do you think a certain sustainability framing should take priority over other framings (e.g., economic, social, economic, or political)?/ Do you miss anything in this sustainability framing?
- How do you see animal welfare contribute to sustainability?
- How do intensive versus extensive farming systems impact sustainability?

### **Goal setting**

- Can you identify synergies (positive interactions) between the above-identified sustainability goals?
- Can you identify trade-offs or externalities (negative interactions) between the above-identified sustainability goals?
- What do you think the main sustainability goals for the poultry and goat farming systems should be in the coming five years?
- How can we make this farming system more resilient?
- How can we make this farming system more viable?
- How can we improve the stability of this farming system?



## Appendix B - Interviews

### Appendix B.1: Interview 1

#### *Participant*

And so we are in the work package three of the tool development. For monitoring different parameters and we are only focused on analysis of goat milk. So we are from the Research Institute in Serbia. So we are developing sensors. That is our main objective is an institute, so also in this project we are developing sensor as well as prediction model for subclinical mastitis in goats. But in a sub clinical phase when it doesn't have a visible consequences on the animals still, and it's easier to treat it in this phase. Because mastitis is a really big economic burden in cows as well as in goats if it happens. I mean for dairy farms. And so basically the methods which are used for detection of mastitis in cows cannot be translated to goats because the gold standard that are used for cows are not applicable for the goats. So we are developing a new model and new tool. Which has not yet been done. So basically we are developing a sensor that is going to measure different parameters. It's going to be mounted on the milking machine and it's going to measure while milking it is going to measure milk yield, milk temperature, other temperature, and conductivity. And all of these parameters as well as other parameters from goat physiology and health status are going to be monitored every day. And we are going to develop an algorithm for prediction of mastitis because only with monitoring different parameters we can get enough data and knowledge to train the algorithm to be able to predict the disease. So basically, we are we're now in the the process of finishing first prototype and we started testing it on the farm. And after, let's say a year of doing tests and gathering the data, we will be able to train the algorithm for prediction.

#### *Interviewer*

OK, so you're currently in-field testing the sensors.

#### *Participant*

Testing, validation of the system? Yeah, that's in this period. What we are doing.

#### *Interviewer*

Yeah, well, that sounds great because in what you told me, I've noticed you've touched on a few topics I want to address. I'm going to share my screen. The way I want to structure this interview is that I will first ask some questions about different sustainability elements within the sector, and right now I chose a framing, social sustainability, environmental sustainability, economic and institutional. So I hope that we can uncover some elements within those different sustainability criteria and. And link some of those elements together to see which sustainability elements are in synergy with each

other, where lie certain trade-offs. Just to get some insight in the challenges in the farming system. And the second part of the interview I will ask about sustainability goals for the sector. For example, I will ask, OK, looking at the sustainability elements, where do you see the future of the sector and that is in terms of resilience of the farming system, viability of the farming system and the stability of the system. But in what you just told me, I noticed you already talked about some elements. For example, animal health versus economics sustainability, for example. My first question to you is: if you have one or maybe two sentences, how do you see sustainability in the context of, in this case, the of goat farming system?

***Participant***

Well, perhaps with this system that we will have, we will have in every moment information about every animal health status and maybe we would be able to prevent diseases. Mastitis as well as some other inflammation and bacterial diseases. So, in that way, we will be able to keep the animals may be healthy for longer and be able to produce better quality milk. Or for the end users. Something like that maybe?

***Interviewer***

OK. So, for example, social sustainability, I heard you say keep the animals healthy for longer.

***Participant***

It is because we will carefully monitor all of the parameters and not only we are focused on mastitis, but there are some other diseases that are going to be able to find out and maybe by that, with that means we will also maybe we won't need that much of maybe veterinarians to be everyday there to monitor animals because we will have the platform where we all of the data will be acquired. And we will be able to, I mean a person will be able to sit on the computer and watch everything and we'll know exactly in moment when something is wrong and then call for example call a veterinarian to check the animal if it is well or not and be able to give a specific medical treatment when necessary.

***Interviewer***

I hear you say two things. On the one hand, you have to spend less time with the veterinarian and, due to your monitoring system you also can more easily target the disease, if I understand correctly.

***Participant***

Yes, yes, yes. In a specific animal, of course, each animal will be monitored so.

***Interviewer***

But as you said for example, so if I can rephrase that, it's also it could be part of environmental

sustainability that you need less antibiotics for example.

***Participant***

Of course, yes, of course, because when you recognize the disease in this subclinical phase, as I said, it is much easier to treat it and cure it even without antibiotics so. And the process of recovery is shorter for the animal.

[technical difficulties with template]

***Participant***

And also you can write there for economic sustainability, that animal is treated faster and recovery is faster, so it can be back in production sooner.

***Interviewer***

Yeah. So, if you look at, for example what you studying now, we have for example less antibiotics are needed. Do you know if there any other environmental parts within your research?

Well, I know that regarding the environment for example, goats much greener animal than cows. I don't know if you can compare that in this sense, because they're not such big methane producers and so I guess that's one of the reasons why people are, especially in Europe now, giving more attention to goat farming.

***Interviewer***

And if you, for example, would have an ideal world where every farmer would use your sensors how would that, for example, impact the environmental sustainability of the farming system?

***Participant***

Let me think about that. I guess that it would impact with that digitalization and durability of the sensors. For a long period, I guess it can save time and I don't know. Maybe, money or something. I don't know. Maybe it won't be necessary to have that many people on the on the farm. Less people will be necessary to monitor the animal, just the ones that are involved in the milking process. And, I don't know what else.

***Interviewer***

No, that's a pretty good one. Let's see save time and money. I will put that near the social sustainability and for example, would there be ...? For, society at large, so to speak. So right now, I'm thinking about the social sustainability, and you can go actually in two directions. One hand is a social

sustainability within a farming system. So, for example, the farmers get enough money for what they produce or maybe gender equality, so to speak. But we you can also look at society at large, maybe less diseases. Sometimes you have issues surrounding bird flu. If you look at, for example, society at large.

***Participant***

Well, yeah, definitely. I guess it will impact the quality of the milk, but also one more important thing is that with this system we are aiming to digitalize the farm, the goat farm. And by doing so, we will have in future I say just potentially: it will be possible to monitor each animal on the regional scale. So, for example, faculties or other institute can also benefit from the data gathered about every animal, so I guess that is also really an important parameter and the aspect that you get with digitalization of the farming, generally.

***Interviewer***

So information about health can be shared throughout the system.

***Participant***

Yes

***Interviewer***

And right now I have put the information sharing, I've put that in institutional sustainability part because I've chosen a broader framing than environmental, social, and economic. Because the institutional also tries to address, for example, who has decision making power in this case, in the farming system. You talked about information sharing. Do you know maybe how it can relate to the institutional dimension that I've put here?

***Interviewer***

It can relate. Maybe because people will have the data about animals and maybe it can be used for, I don't know, if there is a specific problem, maybe they can use the data as evidence to ask for help or to ask for the money for improvement of some aspects of their farming and also, they can ask for the help of the experts. Just by sharing the data.

***Interviewer***

So help from experts in [...].

***Interviewer***

Yeah. And for being easier for people to communicate, communicate which are in the same field of

goat farming, for example. So, it's easier to connect the different farms and share experiences and all of those things.

***Interviewer***

If you look at this right now and the specific dimensions I've chosen. Do you think that there are some elements of sustainability missing in what we have here?

***Participant***

I'm not sure, I think we covered the major things I guess. Maybe you will find some other things that we didn't mention with others. But from my side, I think that's all because we are not goat farming experts. We are from the research part. And so, I guess that... And I'm sharing what I know. So, this is at my best knowledge.

***Interviewer***

Yeah, your expertise is very much needed. [...] I've heard, we discussed, for example, animal welfare in this case and what your company can contribute to animal welfare. So, within the project description of Code Refarm, next to animal welfare, intensive versus extensive agriculture is mentioned as one of the goals within the project of Code Refarm. Do you see, or how do you see these sensors being used in understanding, for example, the effects of intensive versus extensive agriculture?

***Participant***

As we have discussed previously with the partners on the project. Our system is mainly applicable for extensive farming, not intensive. So yeah, that is the issue yeah. Because as far as I understood the difference is that in intensive farming there is lack of machinery I guess, when it comes to goat farming. The farm that we have in the project, [...]. So yeah, we are focused mainly on the extensive farming.

***Interviewer***

Oke, so it's not possible to apply the sensors in the intensive farming case.

***Participant***

For this type of sensor it's mostly for extensive, yeah.

***Interviewer***

And you mentioned that's mostly the reason is that there is not enough instruments for the intensive farming.

***Participant***

Yes, I mean that's for the farm in this project.

***Interviewer***

You didn't feel there was anything missing, in your view on the sustainability?

***Participant***

No, I think that we covered all.

***Interviewer***

Great, because my next step is to see if we can identify some elements of what we have uncovered here that contribute with each other to improve sustainability or maybe elements that can result in more negative trade-offs for sustainability. And do you see some, maybe some post-its, where you think: these two relate to each other?

***Participant***

Sorry, can you repeat the question? I'm not sure that I understood correctly.

***Interviewer***

Oke, I'll zoom in just in case. Because my goal in this is also to understand the dynamics of the farming systems, and how maybe for example an element from economic sustainability positively or negatively impacts other elements, maybe within economic sustainability or another type of sustainability. Do you see anything that relates?

***Participant***

Well, economic sustainability. Definitely. In fact, also social sustainability of this whole system. As well as the environmental sustainability. Because I, for example, you don't need to buy so many antibiotics which are also bad for the environment, so. It is definitely a linkage there. As well as with human resources you are within the economical sustainability you are saving of course money and time on people as well. Or when the animals are healthy, you don't need pay so much for the veterinarians and equipment and diagnostics.

***Interviewer***

Oke, so for example you need less people and that also, and this might positively influence each other.

***Participant***

Yeah.

***Interviewer***

And you mentioned. Yeah, the links between economic sustainability and social sustainability very explicitly at the beginning.

***Participant***

And also for the environment. Because of the spending money on the antibiotics and other medications for the animal. You also save there a lot.

***Interviewer***

Yes, maybe any other links?

***Participant***

Well, definitely if you have the... If you get the information and help from some other institutions and experts, you can also be saving maybe some money or if with the help from the experts in giving advice and things like that. That is also really important link.

***Interviewer***

So, a lot of elements in here actually go back to help the economic sustainability of farmers and farming systems. And do you see maybe anything that might be less positive, the trade-off or synergy between different elements.

***Participant***

Well, if there is a... I don't know the specific farm with a policy not to share data. That can be an issue if someone doesn't want to share data and knowledge in the community, I guess that can be a negative thing for this system.

***Interviewer***

Yeah. So, if somebody will not be willing to share their data, they will actually harm themselves in this case.

***Participant***

And yes, and the system if they have some important data which they don't want to share that. But is also not good for [...], and consumers as well. The product is not good quality for some reason, and somebody doesn't want to share the information on that. That is that can also be a bad thing for the for the consumers.

***Interviewer***

I will put a link between here and here. I will also listen back [to this interview]. [...] Yeah. So if a company is not willing to improve the transparency for example about the quality of a product that might also harm the consumers. Is there anything else?

***Participant***

No, not that I can think of right now.

***Interviewer***

Because we now have some time to try to translate this into certain sustainability goals for the sector. So, with that in mind, I will go to the to the second part. And then I will first want to ask you: how can we improve the resilience of this farming system, for example, from farm to fork. And with resilience I mean it's like protecting them from shocks, for example, right now, what happened in Ukraine and Russia, there was a war and that drove up prices, for example, for food. It could also be climate change. So, what could make a farming system more resilient to those shocks?

***Participant***

I guess with the with the prediction model and tool we will be able to see in advance some changes that are happening in in the animal. And then maybe prevent them from happening or take some steps more in order to stop the, I don't know, the disease of any kind. As well as maybe making the community for goat farming stronger in order not to be able to have such an impact on... I mean that things that are happening globally don't have that big impact on the on the farming and production of milk and the prices. But I guess that's something that they're quite big things that, uh, some communities can not be affected because I guess it's everybody in the world is affected with these things so.

***Interviewer***

Yeah, yeah. But, what you said, for example, maybe if the communities are stronger than the impact of those things are happening might be less.

***Participant***

Yes, yes. Perhaps.

***Interviewer***

So, is there anything else you want to contribute to the resilience goals of the system?

***Participant***



Maybe it helps the community to get stronger and people to connect with all of the information that can be shared and the experiences so. Maybe that is also a big part of the resilience aspect.

***Interviewer***

Yeah. So, we have three goals in the resilience of the system. Then the second one is the viability of the system and that's also related to also more the economic conditions: how can money..., how can everybody make a living in this farming system? And if you would think about goals on how farmers or other people in the farming system can make their money, how do you think that might contribute?

***Participant***

Yes, well, they can make money by ensuring that they have all of the time good quality milk and good quality product which are coming from healthy animals. So, welfare is really important, maintaining the welfare.

***Interviewer***

Welfare is really important. I'll put it in caps, so I know that was really important. Yeah. So, good quality products and that's due to the welfare. And do you have another idea of what would make the system viable?

***Participant***

Well. Connection of the goat farming community, maybe. Everybody working at some way together, maybe that's something that is also important.

***Interviewer***

Together building connections.

Well, and then we are at the last part, which is stable. How can we create a stable farming system? So maybe not per se in the context of external shocks but mainly the internal system of the farming systems.

***Participant***

When I guess with the digitalization of the farms, we will achieve the [capability] in production and animal health, because it will help a lot in monitoring all of the animals.

***Interviewer***

It will help a lot in?

***Participant***

Monitoring the health of all of the animals so. That will be important. And also in helping the... in having good quality products and achieving some I don't know economic status in the system in the milk production. I guess it also helps the stability of the farms with maintaining the good quality product. And having the end users who are satisfied with the with the product. That is also, I guess, important for maintaining the stability of the system.

Because we are speaking from *Farm to Fork* so I guess this is really important aspect as well.

***Interviewer***

So if I can summarize it a little bit, if we look at the whole farming system, with the digitalization, we can improve animal health, but also the community surrounding the farm to improve communication, yeah, and that will lead to better products for the end user.

***Participant***

Absolutely.

***Interviewer***

Just one more question because. How do you think the information sharing with this data will impact, for example, other parts of the supply chain? Maybe, I'm not really sure how that goes with it the farming system, but for example we have maybe retail here or a food producer. Do you think? How do you think this information will affect the supplying networks just outside of the *Farm to Fork* system?

***Participant***

Well, I guess... but everybody because the data will be shared. I guess everybody will know the, which farms have good, I mean healthy animals and good quality products which have the, well, I'll say always the same quality, which is really important for the retailers when they are.

***Interviewer***

Yeah. So, they [supply chain] know what they can expect. [...]. Let's see. Do you have any last things to add maybe? Just before I stopped the recording of the...

***Interviewer***

Well, no, but I I'm. I think that this. This I mean our interview today. I mean, are there? I guess the other people that you interview will complement and add a few things more. So maybe you'll have the have more data. And more information because they may be looking at it from some other angle that I didn't take into consideration so. I guess when you do all of the interviews you will have, maybe, all

of the information that is necessary from different... from different partners and different point of views. Because we are sort of like, let's say engineering part of the work, but you will also have, I guess, interview with veterinarians and people from the farms. So you will get the whole picture for this this part.

## **Appendix B.2: Interview 2**

### ***Interviewer***

Ja top, want dan daar heb ik een kleine template voor gemaakt. Ik heb nu een specifieke sustainability framing gekozen. Dus sociale duurzaamheid, economische duurzaamheid, institutionele duurzaamheid en environmental duurzaamheid. Dus dat is eigenlijk wat ik het eerste deel van een interview graag wil doen en dan als tweede deel wil ik graag die goal setting waar ik het net over had wil bespreken en dan echt in termen van het systeem, zeg maar, van het hele systeem.

### ***Participant***

Ik ben benieuwd.

### ***Interviewer***

Ja ik ook. Zou jij het goed vinden om even kort te beschrijven wat jouw rol is binnen Code Refarm, zodat ik dat ook in het transcript heb staan.

### ***Interviewer***

Ja, dat is binnen Code Refarm zijn we vanuit Nederland natuurlijk met name betrokken diertechnisch met het pluimvee gedeelte. Nou dat is dus bij [bedrijfsnaam] terechtgekomen.

### ***Participant***

En ja bij [bedrijfsnaam] bij ons ligt wat meer de praktische uitvoering bij [bedrijfsnaam] wat meer de aansturing. En omdat ik met name een achtergrond heb in welzijn en huisvesting is dat natuurlijk die zin voor een groot deel om mijn bordje terechtgekomen omdat we pilotstudies moeten doen tussen 5 verschillende houderijsystemen. Op het gebied van welzijn, sustainability. Product control, product quality, enzovoort dus als pluimvee specialist met een focus op huisvesting is het op die manier bij mij terecht gekomen als daar als experiment input te kunnen leveren.

### ***Interviewer***

Als pluimvee expert hoe zou jij binnen één of twee zinnen duurzaamheid omschrijven?

***Participant***

Ja, ik ben echt een welzijnspersoon, hè, dus voor mij valt dierenwelzijn onder het aspect duurzaamheid. En dan zit je, denk een beetje een beetje bovenin in je social sustainability. Dus ja, ik voor mij is duurzaam produceren is op een eerlijke, verantwoorde manier naar mens, dier en milieu een product produceren.

***Interviewer***

Even kijken, dus jij zegt eerlijk en verantwoord produceren?

***Participant***

Ja op een ja eerlijker verantwoorden op een optimale manier eigenlijk al die aspecten combinerend iets produceren, dus waarbij je zowel om milieu natuurlijk, dat waren de meeste mensen vanuit gaan bij duurzaamheid, maar eigenlijk ook gewoon mens en dier, vooral dieren eigenlijk, dus daar ook in worden meegenomen.

***Interviewer***

Ja, dus echt een meer holistische kijk op duurzaamheid, nou.

***Participant***

Ja precies die.

***Interviewer***

Ja nou, want dan ben ik benieuwd, want ik wil eigenlijk eerst die 4 aspecten in kaart brengen en daarna wil ik nog kijken of we bepaalde linkjes tussen aspecten kunnen trekken, maar dat zal ik zo wel laten zien, want jij had het net ook al over sociale duurzaamheid. Voor jou een ideale wereld, ideale *farming system*, hoe zou jij sociale duurzaamheid... wat zijn voor jou de meest belangrijke criteria daarin?

***Participant***

Dat de dieren [...] een goed welzijn hebben. Volgens de hoogste standaarden. Maar, waarbij ze inderdaad wel op een economisch haalbaar systeem gehouden worden, dus dat daar dan ook de prijs voor de boeren tegenover staat. Goede prijs voor milieu moet ook niet ten koste gaan van alle milieumaatregelen of tenminste ten opzichte van de uitstoot en dergelijke en efficiëntie.

***Interviewer***

Goede prijs voor milieu, zou je dat dan vertalen in monetaire waarde?

***Participant***

Hoe moet je het zeggen? Je kunt dieren, denk ik volgens hele... Ze zeggen altijd als jij de dieren houdt volgens de hoogste welzijnsstandaarden gaat dan ten koste van de duurzaamheid. Omdat je een andere [gewassen] hebt, de andere bezetting enzovoorts. Ik geloof dat de wetenschap daar ondertussen het best wel al de kanttekeningen bij zet dat je nog steeds volgens de hoogste standaarden kunt produceren, dat je eigenlijk onderaan de streep zelfde efficiëntie, CO2-footprint, enzovoorts. Nou, dan moet daar vaak wel voor betaald worden, hè? Daar moet de pluimveehouder wat extra *effort* erin stoppen. En dan kan het zeker. En dat moet dus wel betaald worden.

***Interviewer***

En vanuit wie moet dat betaald worden?

***Participant***

Ja, de afnemer of de consument.

***Interviewer***

Dus eigenlijk heb jij al de link gelegd tussen alles wat hier kan. Maar even teruggaan? Jij zei dat het kan, dat je milieuvriendelijk kan produceren, maar ook met een hoge welzijnsstandaard. En hoe zou dat er dan uitzien?

***Participant***

Ja, klopt. Ja, dat is door gebruik van de juiste rassen die hè zowel goed welzijn hebben als goed kunnen produceren. Dat is één van de grootste factoren in *sustainability*: het voer. Ja als het voer niet meer vanuit Zuid-Amerika en ontboste gebieden hoeft te komen, maar er wordt meer eiwitrijk voer lokaal geproduceerd, of Europa in zijn algemeenheid is al lokaal genoeg. Als dat beter opgeschaald en gehandeld kan worden, dan kun je daar ook wel enorm winsten mee behalen. En dan ben je wel heel eind. Door de rassenkeuze, voer meer lokaal, al dan niet meer efficiënt omgaan met de reststromen. Want daarmee kun je natuurlijk ook heel veel drukken. Alleen, daar moeten gewoon nog heel veel ontwikkelingen in plaatsvinden, in de inzet van reststromen, inzet van insecten en andere... Als ik het over eiwitbronnen heb, dan bedoel ik, er wordt heel veel sojaschroot gevoerd, hè? En die soja komt veelal uit Zuid-Amerika natuurlijk, maar als je die kunt wegstrepen. Kunt vervangen dan gaat het hard.

***Interviewer***

Ja, dus daar zie je dan wel een rol in, dat er meer lokaal minder vanuit het vanuit soja producerende landen wordt geïmporteerd. Je noemde net ook dat er nog een paar ontwikkelingen daarbinnen zijn

die daar moeten plaatsvinden. Wat voor soort ontwikkelingen zouden dat zijn?

***Participant***

Ja, er zijn bepaalde gewassen waar ze nu naar aan het kijken zijn. Die ja ook de juiste nutritionele waardes bevatten, alleen die moeten nog..., maar volgens mij moeten die... daar ben ik op zich dan weer geen expert in, maar die moeten nog wat verder veredeld worden en de efficiëntie om die op grote schaal zo goed mogelijk in deze regio te kunnen verbouwen. Ja dat moet nog even doorgepakt worden. Alsmede ook de inzet van reststromen.

***Interviewer***

Voor die nieuwe ontwikkelingen want je zegt: dit gebeurt nog niet, dat moet nog gebeuren. Wie zouden daar bijvoorbeeld..., Wie zouden daar belangrijke partners in kunnen zijn of hoe zou je dat kunnen gaan sturen? Heb je daar een idee bij?

***Participant***

Ja de voerfabrikanten, dus de voerleveranciers, die zijn daar hele grote speler in. Want die inkopen en verkopen natuurlijk al [hun] grondstoffen. Een voerleverancier verbouwd, in principe, niet zelf. Dus ja, die zijn wel de spil in het web wat dat betreft. Dus welke rol zou je daarin moeten hebben? Dat vind ik wel lastig. Moeten zij dan innovatie en optimalisatie bekostigen aanjagen, investeren? Of moet het bijvoorbeeld direct van de bovenste laag, dus zeg vanuit de overheden en de EU gestimuleerd worden dat aan onderlaag, dus de akkerbouwers. Dat die subsidies krijgen al dan niet met de universiteiten er tussenin en hogescholen en kennisinstellingen om dat ja verder te ontwikkelen.

***Interviewer***

Dus als ik jou goed begrijp, moet je dat zowel vanuit de voerleveranciers, *top-down* en *bottom-up*, moet je dat gaan regelen.

***Participant***

Ik denk het wel.

Even kijken, dus jij noemde ook even kijken, dan ga ik het even hier neerzetten. Noem jij nou EU of overheid? Of...?

***Participant***

Ja overheid in de breedste zin van het woord, dus dat kan lokaal, nationaal of internationaal zijn.

**Interviewer**

Even kijken, want we zijn net vanuit *social sustainability*, zijn we meteen doorgeslagen naar de economische en de en milieuaspecten. Maar heb jij binnen jouw expertise nog andere ideeën bij hoe je sociale duurzaamheid kan bewerkstelligen in de *farming systems* op dit moment?

**Participant**

Ja moet je dan de relatie of de transparantie. Van de pluimveesector direct naar de consument toe een beetje in die kant, want misschien dat er meer waardering weer komt vanuit de consument naar de producent. Ik denk dat dat wel kan werken. Ja meer waardering voor het traditionele vak, waardoor er misschien dan ook men meer bereid is die paar procent meer te betalen voor dat product, waardoor er weer meer mogelijk is.

**Interviewer**

Dus even kijken, wat ik dan eigenlijk hoor, is dat dat er een link kan zijn tussen de waardering die een consument heeft en hoeveel ze bereid zijn te betalen. Dus dat is dan het economische aspect dat...

**Participant**

Ja, maar ja, dat is een beetje ja, als je het vergelijkt met de bakker, mensen die naar de bakker gaan, dan betaal je soms natuurlijk een paar cent meer dan bij de supermarkt, maar dan ga je wel naartoe omdat je weet dat het door een ambachtsman is gemaakt, hè? En je hebt meer waardering hebt voor de kwaliteit van het product en dat is bij de slager ook zo Alleen... Ja je ziet dat toch op grote schaal de vleesproducten en de zuivel enzovoorts is dat natuurlijk een veel verder uit elkaar gegroeid. Als je dat toch misschien weer een beetje meer zou kunnen bewerkstelligen. En dan zit je inderdaad weer met je tussen het *economic* en *social sustainability* denk ik? Waardering van de herkomst.

**Interviewer**

‘Waardering van de herkomst’, ik schrijf dat er ook nog even bij. Want jij had het net ook even kort over dat de productie niet op grote schaal plaatsvindt. En dat dan waarschijnlijk die waardering daardoor is afgenomen of begrijp ik, of begrijp ik dat verkeerd?

**Participant**

Ja dat kloof, dus platteland en de stad. Die wordt natuurlijk ook steeds groter, maar ook op het platteland zie je dat denk ik ook wel dat daar zelfs ook de afstand tussen de producent en diegene die gewoon in het dorp wonen groter wordt.

Dat heeft ook deels met schaal te maken. Vroeger waren natuurlijk ook 10 keer zoveel boeren, nu zijn er veel minder met meer dieren. Dus er zijn ook gewoon maar minder boeren en het is allemaal wat

meer industriële. Lang niet alles, want we hebben natuurlijk die extensieve vormen waar dit onderzoek in Code Refarm ook over gaat. Maar goed, je ziet wel, dat zie je namelijk ook vaak bij die extensieve houderijsystemen. Ja die doen ook veel meer hun best om die verbintenis met de consumenten aan te gaan. En die hebben natuurlijk ook een mooi verhaal om te delen.

***Interviewer***

Ja precies dus die afstand overbruggen. Dat kan voor de toekomst redelijk belangrijk zijn. En dan gaan we even door naar de economische duurzaamheid, hoe zie jij dat voor je als het echt gaat over duurzaamheid, en dan het liefst voor het hele systeem.

***Participant***

Ja, er zit ook economische zekerheid in. Los van wat wij nu doen met dit onderzoek. Binnen Code Refarm zie je natuurlijk ook gewoon ontwikkelingen op. Nationaal, internationaal niveau voor wat betreft regel- en wetgeving, hè? Dat ze zaken worden opgelegd die ze moeten doen. De frustratie die je vaak hoort bij in de veehouderij zijn algemeenheid en bij de landbouw ook. Dus ja, ze zeggen nu dit en over 3 jaar gaat het roer weer om en zijn die investeringen allemaal weer bijna voor niks geweest of niet goed genoeg geweest dus economische zekerheid? Ja, toekomstperspectief. En, met name als je het zo noemt: toekomstperspectief en duurzaamheid, ja, dat zit natuurlijk wel. In één. Een oplossing moet natuurlijk ook duurzaam. Dus je aanpassing naar een beter systeem moet duurzaam zijn, moet lang mee kunnen gaan, hè? Moet toekomstperspectief bieden. Dus moment als je een aanpassing wil doorvoeren, moet er ook een toekomstperspectief voor zijn, dat het ook wel lang op deze manier door mag gaan of kan gaan.

***Interviewer***

Ja ja, want als je kijkt naar wat er nu gebeurt, dan zie je bijvoorbeeld dat beleid om de zoveel jaar verandert. En dan kunnen ze de investering niet terugverdienen.

***Participant***

Precies.

***Interviewer***

Zijn er nog andere elementen die jij vindt tussen die tussen economische *sustainability* passen?

***Participant***

Ja dat is eerlijke marge verdeling, hè? Als je ziet hoeveel procent erbij wie aan de vingers blijft plakken. Dat is niet altijd even eerlijk verdeeld, laat ik het zo zeggen. Daar zou ook wel wat meer sturing, of regelgeving, of wetgeving op mogen plaatsvinden, denk ik.



**Interviewer**

Dat was de *true pricing* waar je het over had in workshop?

**Participant**

Ja, dat is zeker eerlijke marge. Dat is nou een goeie ja.

**Interviewer**

Zijn er nog andere belangrijke onderdelen, of denk je dat we [compleet hebben]. Anders ga ik door naar de *institutional sustainability*?

**Participant**

Oké, wat heb je nu staan? Eerlijke marge, zekerheid, toekomstperspectief, eerlijk, betalingsbereidheid. Daar heb je wel voor een heel deel mee te pakken, denk ik, ja.

**Interviewer**

Super. Want ik hoorde jou net ook al een aantal dingen zeggen die op *Institutional Sustainability* kunnen slaan. Maar dat is ook hoe de sector vanuit de ook de wetgeving en de politieke context: wie kan zou besluiten kunnen maken, zeg maar om de sector mee te sturen. Ik hoorde jou net al kort zeggen dat dat misschien niet altijd even eerlijk verdeeld was als je kijkt. Heb jij daar ideeën bij hoe je dat op een andere manier of juist op dezelfde manier zou kunnen doorzetten om daar meer duurzaamheid in te krijgen?

**Participant**

Je duurzaamheid ja. Duurzaamheid is natuurlijk zo'n brede term, ja transparantie en. Ja, ik weet niet hoe dat bijdraagt aan duurzaamheid, maar... Eerlijkheid duurt het langst. Als iets lang duurt, dan is het duurzaam, dus ik denk dat transparantie wel bijdraagt aan eerlijkheid, en eerlijkheid duurt het langst. [Dat vind ik best wel een mooie]. En wat daar dan precies mee bedoeld wordt dat ja is misschien beetje het midden, maar. En. Ja, *equal playing field* zit er een beetje tussen die institutionele en de economic sustainability in. Import, export allemaal onder dezelfde regeltjes moeten produceren, niet onder dezelfde regels produceren dan vervolgens wel mogen importeren of exporteren. Ja, dat heeft allemaal met marktwerking, maar ook met regelgeving te maken.

**Interviewer**

Ja absoluut, want als je kijkt naar de *farming systems* nu, daar is het geen *equal playing field*?

**Participant**

Ja op zich wel, want we mogen exporteren en mogen importeren. Alleen als jij dan vanuit instituties

inderdaad strengere wetgeving daarop gaat nahouden waar je als Nederlandse producent aan moet voldoen. Nou, wat jou alleen maar de kostprijs opdrijft en vervolgens zie je dat je diegene die eerst van jou afnam, die afnemer, ja hetzelfde product gaat afnemen, alleen dan uit een ander land, omdat het daar goedkoop geproduceerd kan worden, omdat zij minder strenge regels hebben. Ja dan ja, dan gaat het natuurlijk wrijven.

***Interviewer***

Wat voor rol denk je dat bijvoorbeeld de overheid daarin zou kunnen hebben, want jij zegt ja, in principe marktwerking zou gewoon moeten werken, maar door die wetgeving wordt het oneerlijk. Heb jij een idee hoe we dat kunnen aanpakken om het eerlijker te maken?

***Participant***

Ja, dan bevind ik me op glad ijs op iets waar ik niet al te veel per se de kennis op heb. Maar ja, je zou zeggen bijvoorbeeld, je mag importeren, maar dat bijvoorbeeld dan importheffingen of zo omhoog gaan of belastingen/accijnzen en dat soort dingen van.

Landen waar het anders gaat? Ja, daar heb ik niet helemaal veel kaas van gegeten. Wat daar wel of niet politiek of economisch toegestaan is met vrije handelsgrenzen en weet ik veel hoe wat. Maar ja, dan zul je in die richting komen.

***Interviewer***

Ja is goed. Dan laat ik deze dimensie, laat ik hierbij zitten en dan ga ik voor dit stukje ga ik nog door naar de *Environmental Sustainability*, want daar hebben we het ook al kort over gehad. Is er nog iets wat jij vindt dat er hierin mist of wat daar echt bij zou moeten zijn als we duurzaamheid gaan beoordelen in deze in farming systems?

***Participant***

Dan kom je ook weer op... Er zijn twee dingen waar men druk mee bezig is, maar waar de progressie niet zo heel erg vordert, vind ik althans. En dat is van de week inderdaad ook toevallig weer hot topic geweest: je hebt die emissie reducerende technieken, die innovaties, die zijn allemaal weer tot de grond afgebrand omdat ze bijna allemaal werden bekritiseerd dat ze helemaal niet waarmaken wat ze pretenderen. Dus ja, die emissie reducerende innovaties. Maar dat is end of pipeline hè? Dus kun je de emissies op het einde dan nog afvangen? Maar het is natuurlijk nog beter als je bij dat de bron kunt aanpakken. En daar, ik weet niet welke winst daar nog te behalen is, maar daar... ja dus niet emissies verminderen bij de bron, ja emissies voorkomen bij de bron. Dat is nog een mooier woord dan verminderen.

***Interviewer***

Ja, want daar is al veel in gedaan? Want jij zegt: ik weet niet hoeveel winst er nog te behalen is.

***Participant***

Ja precies. Weet ik niet, misschien is het wel zo, maar...

***Interviewer***

Helemaal goed. Even kijken. Heb je het idee dat dit redelijk compleet is [hele template] of mis jij hier nog iets in? Ook in de bijvoorbeeld de framing van duurzaamheid is er iets waarvan je zegt, dit is nog heb ik nog niet kunnen terug laten komen.

***Participant***

Nou, voor mij is framing in duurzaamheid... Het belangrijkste staat voor mij in het midden, hè? Tenminste wat ik altijd toegevoegd wil hebben aan de *sustainability*, is inderdaad dat die holistische benadering, dierenwelzijn mee moet worden genomen. Dus dat zeg je... heb ik in ieder geval mijn stempel heb ik hier op mogen drukken, dus daar ben ik al helemaal blij. Dan ben ik al helemaal blij mee dan. Nee, hier heb je natuurlijk, denk ik wel voor het grootste deel wel mee te pakken, denk ik. Voor wat mij betreft zat ik ervan vind.

***Interviewer***

Oké, want in, want de volgende stap is dat ik even met jou wil kijken, want daar heb je ook al heel veel van benoemt. Maar in de tools die nu al bestaan die duurzaamheid meten worden vaak de links tussen de verschillende dimensies, zeg maar worden of niet benadrukt of worden alleen de positieve aspecten heel erg benadrukt. En, ik wil even met jou kijken of jij een idee hebt van welke post-its of welke dimensies veel impact kunnen hebben op elkaar en waar ook rekening mee gehouden moet worden in de toekomst.

***Participant***

Ja dus eigenlijk wat voor de meest belangrijke post-its zijn die hierop staan, bedoel je?

***Interviewer***

Ja bijvoorbeeld of je een linkje kan trekken, bijvoorbeeld [zoals je net al benoemde] tussen zekerheid en waardering bijvoorbeeld. En of dat die elkaar of positief of negatief kunnen versterken.

***Participant***

Ja, nou ja, waardering, ja zo om, maar meteen mijn die te beginnen. Ik denk dat waardering en bereikbaarheid tot betaling van een meerprijs. Ik denk dat die wel heel sterk is. En. Even kijken wat

staat er nog meer? Ik zet je ook even op het andere scherm, dus niet dat je denkt dat ik wegkijk, maar dit scherm is wat groter. Ja bijvoorbeeld die transparantie onderin met eerlijke marge. Ik denk dat dat elkaar ook kan versterken.

***Interviewer***

Dan hebben we het over transparantie en een eerlijke marge. Ja.

***Participant***

Nou kan je natuurlijk daarboven in die hoogste welzijnsstandaarden naar dierenwelzijn, daar in het midden natuurlijk. En je hebt dierenwelzijn daar ook al staan. Hetzelfde geldt een beetje, met dat juiste ras ja die die kies je wel uit omdat hij niet alleen goed groeit, maar dat die er ook goed mee om kan gaan... dat wat makkelijker is om het welzijn te borgen.

***Interviewer***

Ja dus in dat opzicht is het kiezen van het juiste ras ook voor de dieren positief. En jij zegt ook, het wordt makkelijker, dus heeft dat dan ook invloed op degene die ze houden?

***Participant***

Ja in die zin ze hebben minder afkeuren, minder uitval enzovoorts. Principe houden ze dan een betere marge eraan over. Ja en die nieuwe gewassen, dat voer, efficiënter reststromen. Dat clubje van die 3 ja, die zijn inherent verbonden aan de voerleverancier die daaronder in stond. Die moeten het inkopen of verkopen, en.

***Interviewer***

Die voer leveranciers hebben, gaan daar veel invloed op hebben. Of hebben daar veel invloed op?

***Participant***

Ja, die zijn in ieder geval... Ja inderdaad van goh kunnen ze het krijgen of we gaan ze willen dat ze het kunnen krijgen, gaan ze het wel willen leveren? Of moeten zij daarin investeren? Ze zijn ieder geval een hele belangrijke speler. En welke rol precies weet ik niet, maar ja, ze zijn er wel zeer belangrijk in.

***Interviewer***

Nog andere dingen die jij zo ziet?

***Participant***

Ja, die afstand tussen producent en klant. Ja, dat is in die zin dan ook, heeft natuurlijk ook te maken

met die waardering van de herkomst. Die zaten wel ongeveer binnen hetzelfde ballonnetje, maar... Helemaal rechts ja. Ja en ik vind bijvoorbeeld de boer wordt opgelegd dat ze alles moeten redu-, die emissies enzo moeten reduceren. Maar zij kunnen nooit zelf die innovaties aanjagen, de kosten, dus daar zit echt gewoon rol van de overheid bij. Overheid die innovaties deels mede financiert. Hetzelfde als dat de overheid een grote rol speelt waarschijnlijk in dat *equal playing field*. Door daar beslissingen in te nemen. Hoe het zit met bepaalde dingen? Nou ja, dat is een beetje het... Die importheffing staat daar natuurlijk heel dichtbij dan. [Dat wordt] bepaald door de overheid. Ja, ze staan allemaal natuurlijk niet voor niks bij elkaar, maar laat dat die afstand tussen producent en klant waardering, herkomst, maar ja, en de transparantie is er natuurlijk. Die ze ja principe trek je hem nu ook al ongeveer doorheen, zoals een lijntje nu staat. Ja zoiets.

**Interviewer**

Ja ja. Oké. Even kijken zijn er nog andere verbanden die jij hier zo ziet? Want anders gaan we door naar het volgende onderdeel.

**Participant**

Ja, dat voer van eiwitrijk en lokaal. Dat mag inderdaad zeker ook nog wel naar die voerleverancier toe. Alles wat voer gerelateerd is, dat is eigenlijk gekoppeld aan die voerleverancier.

**Interviewer**

In dat geval gaan we dan door naar het tweede onderdeel. Wat hierin belangrijk is, is dat we even kunnen kijken naar de doelstellingen voor de duurzaamheid.

En op dit moment heb ik daar 3 verschillende aspecten voor gekozen omdat die volgens de literatuur representatief zijn voor de dynamieken die daar kunnen spelen in een *farming system*. En dan gaat het over *resilience*. Laten we dat laat ik eerst beginnen met *resilience* en dat gaat juist over het systeem versterken tegen schokken van buitenaf. Even denken, hoe heb jij, heb jij een idee hoe, want en die schokken van buitenaf, die mag je dan best wel breed zien, bijvoorbeeld. Ik weet dat heel veel mensen het hebben over de oorlog en dat dat iets heeft gedaan met de graanprijzen, maar ook over klimaatverandering, dus alles wat niet in het systeem zit heeft hier impact op. En, hoe denk jij dat een systeem zichzelf daartegen kan wapenen? Of wat zijn daar voor de toekomst, denk jij, belangrijke aspecten voor?

**Participant**

Ja inderdaad, maar ja, daar staat de titel ook voor [robuustheid] en weerbaarheid van een houderijsysteem, balanceren ze elke keer wat randje, of zit er altijd voldoende marge in om met de hitte of met droogte om te kunnen gaan bij wijze van spreken of hè? Met die voerprijzen is er altijd

een reserve of hun back-up die het kan opvangen. Dus zijn er genoeg reserves naar de positieve en de negatieve kant toe, zodat je er altijd met de tegenslagen om kan gaan. Ja en dan is dat een hele brede term, maar dat kan zijn van hé dat er genoeg economische reserve is, maar of dat de dieren sterk genoeg zijn om met iets om te kunnen gaan, of dat de bevoorrading van dus met name voer eigenlijk altijd gewoon wel enige mate van borging kan hebben en... Dat er daar allemaal... Dat je niet elke keer bij alles op een bandje randje hoeft te balanceren.

***Interviewer***

Zijn er nog andere aspecten die jij denkt dat daar belangrijk in zijn.

***Participant***

Ja, dat zit een beetje ook, maar die weerbaarheid, *resilience*, zit beetje in dat toekomstperspectief hè? Dat je dat je niet met de wind van de politiek per se altijd hoeft mee te waaien? Dat je daar zo, weet niet precies hoe je dat moet benoemen. Maar ja, zit er wel van... Het ene het ene kabinet zegt, het volgende zegt dat. Dat je daarvan soort van veilig gesteld wordt, dat je daar niet altijd de dupe van bent. Ik weet niet zo goed hoe je dat moet benoemen, maar.

***Interviewer***

Is dat een soort van ruimte voor autonomie? Zou je dat zo noemen? Los van de politiek, van de politieke wind die waait.

***Participant***

Voor een boer zou het heel fijn zijn om beetje autonomie te hebben, maar ik denk niet dat het zo werkt. Nou goed, ik weet ook niet hoe je dat anders wil waarborgen dat je niet, ja onderhevig bent aan de grillen van de politiek. Toch inderdaad, ja, hoe noemde jij dat? Zelfstandigheid of hoe noemde jij hem net zo mooi? Ja, Dat is op zich wel ideaalplaatje.

***Interviewer***

Dan zet ik het er nu zo in. Oké dus aan de andere kant dat je niet de hele tijd te hoeft te balanceren als er iets gebeurt en aan de andere kant dat je ook, ja, wat jij zegt niet mee hoeft met de grillen van de politiek. Nog andere aspecten?

***Participant***

Nee? Nee, ik denk het niet.

***Interviewer***

Want dan kunnen we door naar de tweede: viability, heb ik dat genoemd en dat gaat juist over de

soort van economische weerbaarheid, dus daar hebben we het net. We hebben het daar in het vorige stukje ook al kort over gehad, maar dat het voor iedereen mogelijk is om een eerlijke boterham bijvoorbeeld te verdienen. Als we daar een toekomstperspectief voor... Als je daar toekomstperspectief qua duurzaamheid aan wil geven, hoe zou je dat dan verwoorden in een doel?

***Participant***

[...] de leefbaarheid te willen... Ja... Ja het opzetten van een robuust systeem met toekomstperspectief. Maar ja, dat is natuurlijk wel een beetje parapluterm achter elkaar plakken. Ja die autonomie, dat vond ik op zich wel een... Het is natuurlijk gewoon heel groot iets, maar het is wel natuurlijk van ja... Garantie van bestaansrecht en dat kan door je autonoom op te stellen, hè, ik bedoel, ja. De wereld zat toch gevoed moeten worden, dus ze heeft natuurlijk een hele krachtige positie ergens, de veehouderij. En dat dat garandeert [ergens wel] autonomie. [Weet je, we gaan niet even filosofisch bijna...] Zonder boeren geen voer. Zonder boer, geen voer. Ik zie de borden langs de weg staan. Maar ja, er zit een kleine kernwaarde in, maar... Ze hebben altijd bestaansrecht, alleen de wijze waarop dat is natuurlijk...

***Interviewer***

Er gebeurt heel veel omheen bijvoorbeeld? En wat we eventueel kunnen doen is even kijken naar het volgende kopje. En dat gaat over de stabiliteit binnen het systeem, dus we hier bijvoorbeeld gekeken naar de schokken van buitenaf bij het systeem, maar er kan ook eventueel iets binnen een systeem kunnen voorkomen waardoor die minder stabiel is. Hoe kan je binnen dat *farming system* kan je ervoor zorgen dat een soort van stabiliteit gewaarborgd wordt?

***Participant***

Meer zelfvoorzienendheid, dus minder invloeden van buitenaf. Dus het lokaler proberen te houden. En, dat is op zich is dat wel weer een mooie met daar links meer lokaal produceren in plaats van uit Zuid-Amerika, of zo een hele grote producent als Oekraïne – is dan nog steeds wel een soort van Europa – maar hè? Dat als je lokaal, zelfvoorzienend, onafhankelijk. De pluimveehouders zijn, vaak alsnog in die zin, afhankelijk van de voerleverancier. Maar er zijn ook pluimveehouders die het grootste deel van het voer gewoon op hun eigen land hebben staan en dan in hun eigen voerfabriek kunnen vermengen en zelf voeren. Dus ja, dan ben je ook nog onafhankelijk van die voerleverancier. Dus daar zit veel stabiliteit: als je het zelf allemaal kan aanvoeren ben je minder gevoelig voor dingen van buitenaf. Ja, dat is past dus misschien nu ook wel een beetje bij daarboven, zowel een stabiliteit als *resilience*: zelfvoorzienendheid, ja, die past bij allebei denk ik wel een beetje.

***Interviewer***

Dan zal ik het daarboven ook nog even bij zetten.

***Participant***

Dat maakt je minder afhankelijk. Maar ja, als het bij jou dan misgaat is misschien wel de stront meteen heel erg aan de knikker, maar. Is wel een risico natuurlijk.

***Interviewer***

Ja, dat klopt. Dat is een risico, want inderdaad, jij zei bijvoorbeeld eerder ook dat je genoeg reserves bijvoorbeeld hebt, en aan de andere kant ook zelfvoorzienend zijn. Zou je die reserves helemaal zelf gaan opbouwen?

***Participant***

Ja reserves is in die zin best breed, dat dat kan gewoon op bedrijfsniveau zijn, maar het kan ook meer lokaal of landelijk, of wat dan ook zijn. Dat je in ieder geval altijd een soort van uitvalsbasis hebt van redelijk dichtbij, hè? Dat als Zuid-Amerika, gaat doen, of wat nu Oekraïne is gebeurd, dat je dat gewoon vanuit Nederland of Duitsland of Frankrijk of in ieder geval enigszins lokaal – ik vind lokaal soort van een straal van 300 tot 500 km. Vooral voor de intensieve pluimveehouderij is een straal van 300 tot 500 km bijna lokaal te noemen, want dat is in een dag te bereiken, of het nou over een vrachtwagen gaat met kuikens of met voer. Dus ja, dat is nog te overzien en voor extensief ja, vind ik wel dat lokaal wel iets kleiner is, dan heb je het eerder landelijk of provinciaal zelfs maar. Ja, ik denk dat met lokaal veel – als je lokale zekerheid hebt met lokaal als subjectief begrip – daar kun je al veel in, eigenlijk al deze drie [*resilience, viability, stability*] die we hier zien, waar we het hier over hebben ja, speelt daar een grote rol in dat ik het zo zeggen.

***Interviewer***

Lokaal heb ik even tussen aanhalingstekens gezet om relativiteit [aan te geven]. Oké, zijn er nog, zijn er nog doelen die duurzaamheid binnen de sector kunnen waarborgen die er nog niet staan of iets waarvan jij vindt, oh, hier moeten wij met z'n allen in het systeem naartoe gaan werken?

***Participant***

Ja lastig. Bijvoorbeeld in de hele pluimveehouderij kenmerkt... Heeft volgens mij best wel... Ze verspillen bijna niks, dus er is bijna geen verspilling van grondstoffen en dat soort zaken, dus daar is weinig meer te behalen aan duurzaamheid. Er is nog wel wat te winnen aan welzijn, maar goed, dat dat staat wel deels in. En wat voor doelen zijn er nog meer? De sector doet het op zich goed, denk ik. Vergeleken met andere houderijsystemen. Ja, als je ook naar zijn dingen kijkt, dat is niet echt duurzaam maar toch. Medicijnen, antibiotica gebruik. Nou, dat is bij de pluimveehouderij zo drastisch hard gekelderd naar heel weinig of tot nul. Ja, daar heeft men de laatste jaren enorme slagen behaald. In vergelijking met de kalverhouderij: bijvoorbeeld de kalverhouderij, is die ongeveer 30 of 50%



gehalveerd, geloof ik. Maar de helft van heel veel is nog steeds heel veel. Daar zal [naam] misschien wel anders over nadenken want die is kennis-innovatie-makelaar geloof ik voor de kalverhouderij. Ja, welke doelen zijn er nog meer? Ja. Ja, je kunt er nog verder boven staan: ja, gewoon minder eten. Dan wordt het ook duurzamer.

***Interviewer***

Dat alle consumenten minder eten?

***Participant***

Ja minder dierlijke producten eten, maar ja ik weet niet of dat hier de insteek is of dat er bij te... Maak er maar een rode post-it van.

***Interviewer***

Ik twijfel waar ik die [post-it] onder moet laten vallen... Ik zal hem [onder *resilience*] even neerzetten en dan denk ik er dan nog even over na.

***Participant***

Ja precies, het is twijfelachtig of die er wel in moet of niet.

***Interviewer***

Ja, het kan belangrijk zijn om het om het te benoemen, maar...

***Participant***

Nou, je kunt er een soort van mee beginnen: los van door het minder eten van dierlijke producten, en daarmee dus duurzaamheid van die hele sector te bevorderen. Want dan is er minder productie nodig. Dan heb je hem gehad klaar. Dan zijn dit andere dingen in duurzaamheid.

***Interviewer***

Ja, het moet ook echt haalbaar zijn en dit is natuurlijk wel een heel groot maatschappelijk aspect waar misschien niet. Ja, maar dat is waar deze waar deze systemen niet direct impact op hebben.

[...]

***Interviewer***

We hebben nu best wel veel informatie hier staan. Heb jij het idee dat voor jou het meeste compleet is?

***Participant***

Ja, dat denk ik wel.

***Interviewer***

Oké super ja want even kijken. Ja in dat geval...

***Participant***

Maar ik weet niet precies. Ja, dat past misschien bij institutionele sustainability en ik weet niet precies wat ik daarvan moet zeggen, of wil zeggen, of hoe dat erin moet: is de rol van de NGO 's. Maar ik weet nog niet, ik weet niet precies wat ik daarmee wil zeggen. Maar ja, goed, je hebt zowel de dierenwelzijns-NGO's zoals ook natuurlijk milieudefensie en dat soort dingen. Ja, die worden natuurlijk ook steeds... Die krijgen ook steeds meer invloed. Dat dus, maar ja, precies wat ik daarmee wil zeggen, weet ik niet. Maar ik denk dat het wel handig is om ze ergens een keer erin te vermelden.

***Interviewer***

Ja, want die hebben uiteindelijk best wel een rol in de sturing ook van de sector? Ja, of ook beïnvloeden van consumenten bijvoorbeeld vragen en hoe dieren gehouden worden. Ja, dat is een goeie want voor mij is het ook belangrijk om een beeld te hebben van: wie maakt nou de beslissingen? En, wie niet? Dus door de NGO's te benoemen, denk ik dat daar dat daar een heel belangrijk deel mee, ja ook mee opgeschreven kan worden. Als het als volledig is voor jou, dan stop ik met het delen van mijn scherm.

**Appendix B.3: Interview 3**

***Interviewer***

In het onderzoeksvoorstel van Code Reform staat dat dat we de businessmodellen, daar ook een *sustainability assessment* op gaan toe moeten passen om te kijken: welke van die businessmodellen nou het meest duurzaam zijn. Het lastige hieraan is ja, die businessmodellen die zijn nog niet in de praktijk, zullen nog niet allemaal bestaan. En daarom ga ik kijken of ik met deze analyse kijken wat volgens verschillende stakeholders een duurzame richting is en daar dan en daarmee de *sustainability assessment tool* maken. Dus ik zou eigenlijk graag willen dat vanuit jullie expertise op de duurzaamheid in de sector, of we daar wat duurzaamheidscriteria uit kunnen maken. Ik heb een kleine template gemaakt. Kunnen jullie hem zo zien? Top. En dan wil ik kijken of ik deze samen met jullie kan invullen, dus eerst wil ik het hebben over de verschillende duurzaamheidsdimensies en als laatste wil ik nog kijken hoe jullie een duurzaam systeem echt voor je zien. En zouden jullie, zodat ik het ook in het transcript heb staan, allebei even kort kunnen zeggen wat jullie expertise is.

***Participant***

Zal ik beginnen? Ik werk als projectmanager bij het *Poultry Expertise Centre*, achtergrond in dierwetenschappen en ik hou me veel bezig met emissiereductie. Dus dat is een al gelijk ook een onderdeel van duurzaamheid. En verder hebben wij allerlei projecten op het gebied van dierenwelzijn, die gezondheid. Wij zijn vooral altijd bezig met over de verschillende partijen heen, de sector bekijken en verder helpen.

***Interviewer***

Dank je.

***Participant***

Ja, ik ben vooral ook om mee te kijken met [naam], omdat ik er zelf heel veel van kan leren, dus ik denk dat de focus vandaag echt ligt op het interview met [naam]. Mijn achtergrond is *Animal Sciences* in Wageningen en vooral de focus heb ik op dierenwelzijn en huisvesting, maar eigenlijk heel erg gefocust dus op het dier zelf.

***Participant***

Je doet jezelf hier nu wel een beetje te kort hoor [naam].

***Participant***

Ja, vind je?

***Participant***

Ja, ja, je bent hier gewoon als dierenwelzijnexpert.

***Participant***

Ja, dat is ook zo, maar zo had ik het een beetje meegekregen. Ook van mijn collega's van: goh je kan er heel veel van leren, dus zo had ik het zelf in mijn hoofd. Maar ik vind het ook heel interessant om mee te denken en ik ga ook zeker dan mijn input leveren. Als het welkom is.

***Interviewer***

Absoluut ja, want dierenwelzijn is ook een groot onderdeel van duurzaamheid, vind ik zelf, dus het is goed als je daar ook je expertise in kan meenemen. Even kijken, want ik zou eerst..., als we kijken naar dit plaatje, zou ik eerst graag willen beginnen in het midden en dan wil ik eigenlijk vragen wat voor jullie in één of twee zinnen duurzaamheid is in de context van dit systeem.

***Participant***

Dat is echt gelijk. Een gigantisch, moeilijke vraag. Ja, wat is, wat is duurzaamheid? Duurzaamheid is denk ik een systeem wat mee kan gaan naar de toekomst. En. Ja ik noem dan zelf altijd die onderwerpen die hier ook al staan, dus dat het economisch, sociaal en milieutechnisch dat daaraan wordt gedacht. En ja dat alle partijen daarin meegenomen worden.

***Interviewer***

Helemaal goed, dankjewel. En [naam], heb jij daar ideeën bij?

***Participant***

Ik link het heel erg ook aan houdbaarheid, dus iets wat inderdaad voor de toekomst. Langer mee kan gaan iets wat duurzaam is, wat zich stand kan houden eigenlijk.

***Interviewer***

Dus jullie noemen eigenlijk allebei, ook wel die toekomstvisie. Ja dit was inderdaad meteen een hele grote vraag, maar eigenlijk wil ik met jullie naar die verschillende vier dimensies gaan kijken en dat we er samen achter komen wat jullie daarin de meest belangrijke criteria vinden als het gaat om duurzaamheid. Laten we dan beginnen bij sociale duurzaamheid. En dat kan heel erg gefocust zijn op mensen of op dieren, of de maatschappij als geheel. Zijn er aspecten in duurzaamheid waarvan jullie denken, dat valt hier onder?

***Participant***

Wat ik hier altijd onder vind vallen, is, ja, je kan de term plattelandontwikkeling geven of zo, Maar dat het ook voor de mensen die nou ja rondom veehouderijbedrijven wonen dat het daarvoor houdbaar is en leefbaar is enzovoort. Dat het ook onderdeel is van het landschap wat we hebben. Maar ook de sociale voor de boeren zelf. Die zitten natuurlijk in een sociaal netwerk die dragen daarin hun eigen dingen bij. Dat is niet alleen maar het produceren van voedsel, maar die hebben allerlei rollen in sociale structuren. Nou op het platteland vooral. Dus ik denk dat dat een hele belangrijke is.

***Interviewer***

Ja en je had het over plattelandontwikkeling en dat het ook voor de burens duurzaam moet zijn, is dat iets wat nu nog niet speelt of waar..., wat zou daarin verbeterd kunnen worden?

***Participant***

Bij waar je aan moet denken, is dat iemand die naast een veehouderij woont, daar geen last van heeft. Dan kan je denken aan gezondheidseffecten. Maar je wilt het ook hebben dat het... Dat de bedrijven zeg maar mooi zijn om te zien. Dat klinkt een beetje triviaal, maar dat is toch iets wat belangrijk is als

je ergens leeft.

***Participant***

Ja.

***Participant***

Maatschappelijke acceptatie van de buurt.

***Interviewer***

Wat zou er dan voor jou onder maatschappelijke acceptatie vallen?

***Participant***

Oh nou, ik dacht eigenlijk meteen aan dat ik het idee heb dat consumenten steeds bewuster worden, ook over dierenwelzijn en dat ik het gevoel heb dat bijvoorbeeld vlees eten of eieren eten dat dat maatschappelijk misschien steeds minder geaccepteerd gaat worden, of dat mensen steeds meer proberen van: nou, ik eet nu ook een dag in de week vega. Dus ik ben benieuwd wat daar ontwikkelingen in zijn en ik denk dat dat een grote rol gaat spelen aan de ene kant. Dus ik denk dat, dat bedoel ik zelf met maatschappelijke acceptatie en ik denk ook van de burens, hè dat je echt trots kan zijn op je buurman van nou, die heeft een leuk bedrijf, daar haal ik mijn eieren. En, dat is wel heel belangrijk eigenlijk: wat de consument wil, wat de burgers willen.

***Interviewer***

Ja dus, zij hebben daar ook een grote rol in omdat te sturen? Ja.

***Participant***

Ja zeker ja heel erg. En ook komt de stimuleren dit soort ontwikkelingen naar meer duurzaamheid, moet denk ik gestimuleerd worden en moet animo voor zijn onder de burgers. Anders dan lukt het niet, want het kost natuurlijk geld.

***Participant***

Maar wel op zo'n manier dat het behapbaar is voor boeren. Kijk, we hebben nu die campagne Taboer om te praten over mentale problemen waar boeren mee worstelen om dat gewoon de zelfdoding onder boeren best wel hoog is. Maar ik denk dat dit dat ook iets is van *social sustainability*.

***Participant***

Ja en waar ik meteen ook aan dacht *social sustainability*, want dat inderdaad: de boer, maar ook voor de consument. Want voor de consument die moeten eigenlijk die ontwikkelingen stimuleren en meer willen betalen voor duurzame innovaties. Maar ja, we kampen natuurlijk ook wel met armoede en al

helemaal met Oekraïne. Het moet ook *sustainable* zijn, zeg maar voor de consument. En dat valt natuurlijk ook onder ja of misschien *economic sustainability*, maar dat is ook wel een groot aspect van het sociale, denk ik.

***Interviewer***

Als ik het betaalbaar voedsel noem [in de template], is dat dan voor jou redelijk hoe jij het bedoelde?

***Participant***

Ja, ik denk het wel hoor. Dat betaalbaar voedsel.

***Participant***

Maar ook passend bij de diversiteit van de samenleving. Want het gaat natuurlijk niet alleen maar de keuze over wat je eet gaat natuurlijk niet alleen, maar over betaalbaarheid, maar ook bijvoorbeeld over gezondheid, ook over religie over afkomst dat speelt natuurlijk ook een rol.

***Interviewer***

Ja ja, dus we moeten, er moet ook gewoon eten geproduceerd worden wat past bij die diversiteit eigenlijk?

***Participant***

Ja

***Interviewer***

Zijn er nog andere onderwerpen hier, die jullie vinden dat daartussen passen?

***Participant***

Nou bij *social sustainability* ik dacht misschien ook een deel qua nieuws.

***Participant***

Beeldvorming of zo?

***Participant***

Ja beeldvorming van het nieuws omdat je ontzettend veel met emissiereductie. En, ik denk dat [...] enorm consument en de burger kan sturen in hoe hun denken erover over de boeren in Nederland.

***Interviewer***

Ja want [boeren] zijn af en toe best negatief In het nieuws gekomen, met die stikstofdiscussie

bijvoorbeeld? En dan wil je de positieve kant eraan laten zien?

***Participant***

Ja, ik denk dat het ontzettend kan sturen in hoe geaccepteerd het wordt, in hoe het wordt gebracht door de media.

***Interviewer***

Nog andere criteria?

***Participant***

Niet dat ik nu kan bedenken, misschien komt het zo nog.

***Participant***

Misschien sociale media, maar dat valt ook onder beeldvorming misschien.

***Interviewer***

Ja, en hoe zou jij sociale media hier onder zien passen?

***Participant***

Nou, misschien is het een persoonlijke opvatting, maar ik heb soms wel het idee dat sommige *influencers* niet heel veel verstand hebben van dierenwelzijn of dieren op zich en dan toch een mening erover hebben en daarmee heel veel mensen beïnvloeden. Dus ik denk dat dat ook kan bijdragen.

***Interviewer***

Je kan altijd terugkomen hier naartoe, maar voor nu gaan we dan verder naar de economische duurzaamheid. Die is... In de literatuur ook zijn ze er nog niet heel erg over eens wat daar precies onder moet vallen. Maar als jullie economische duurzaamheid zien en vanuit jullie expertise hieraan denken, wat zou voor jullie hieronder moeten vallen?

***Participant***

Ik denk dan gelijk aan het verdienen van een goede boterham door de veehouder met de eisen die aan hem worden gesteld, dus dat het niet zo kan zijn dat er alleen maar eisen worden gesteld, maar dat die niet... Dat hij dat vervolgens niet kan bekostigen, of heel erg op zijn eigen salaris moet inkrimpen. Maar dat daar de ruimte voor is. En inderdaad, wat [naam] eerder ook aangaf dat het ook niet zo is dat het alleen maar bij de consument vandaan moet komen, want dan krijg je dat alle rijke mensen die kunnen nog bepaalde producten met hele hoge criteria kopen terwijl de armeren die zitten met minder kwalitatieve producten.

***Interviewer***

Ja en jij zegt: het moet... om een eerlijke boterham te kunnen verdienen, moet dat niet allemaal bij consumenten vandaan komen. Wat zou daarin kunnen compenseren? Zeg maar om die boeren een eerlijke boterham te kunnen laten verdienen?

***Participant***

Daar kan de overheid ook wat in bijdragen. En dan is het ook belangrijk dat ze niet alleen krijgen voor het voedsel produceren, maar ook de andere diensten die zij verlenen, zeg maar. Dus als het bijvoorbeeld, daar zullen we ook nog wel opkomen bij *environmental sustainability*, nou ja, als je een dienst levert die bijdraagt aan het verbeteren van de natuur bijvoorbeeld, dan mag daar ook best voor betaald worden.

***Participant***

Ja ja, en ik denk dat de overheid ook nog kan bijdragen in wet- en regelgeving, want bijvoorbeeld sommige boeren die hebben dan emissie reducerende machines gekocht die daaraan kunnen helpen bijdragen in de hoop dat ze dan hun ja huidige *stock*, hun huidige aantal dieren konden behouden. Eerst zou dat dan wel mogen bepaalde machines, dus toen hebben ze een dure investering gedaan en later bleek dat toch niet voldoende te zijn. Dus is die investering voor niks geweest en ik denk dat daar de overheid met advies, misschien van goh, dit werkt wel, dit werkt niet. En dus eerlijke wet- en regelgeving wel kan bijdragen of iets kan stimuleren.

***Participant***

Ik zou dat meer het bieden van zekerheid of zo noemen, want. Ik denk dat dat ja eerlijke wet- en regelgeving is ook belangrijk hoor, maar dat is voor dit voorbeeld denk ik vooral de zekerheid en het... Hoe zeg je dat? Nou ja, dat het niet tijdens de wedstrijd de regels veranderen.

***Participant***

Ja klopt ja. Ja dat dat in zo'n transitie boeren dan ook beter misschien worden begeleid dat ze zeggen van goh, we hebben adviseurs en inderdaad, als je dit koopt, dan mag je dat ook zeker toepassen.

***Participant***

Ja, maar dat was ook wel het geval, maar men had toen gewoon niet de kennis die er nu is. Dus, en dat kan natuurlijk, maar dan kan je niet zeggen van oh, maar dan laten we die boer daarvoor opdraaien.

***Participant***



Ja dat inderdaad ja.

***Interviewer***

Ja want [naam], ik hoorde jou ook zeggen: overheid kan ook door middel van advies de boeren helpen door die transitie heen, valt dat dan ook onder die betere begeleiding door de overheid?

***Participant***

Ja dat denk ik wel. Ik denk dat veel boeren ook doordat het er eerst wel was en daarna niet, dat ze gewoon ook een deeltje vertrouwen missen. En als ik daar wat over te zeggen had, dan zou ik zeggen van joh: rol adviesgroepen uit en neem ze echt een beetje, misschien zelfs bij de hand om gewoon daar duidelijk mee te helpen en sturing aan te geven.

***Participant***

Maar ik zie er wel alleen maar een aanjagende rol in voor de overheid. Want inderdaad, veehouders die zitten niet te wachten op overheidsmensen die ze is even een advies geven, want daar is inderdaad het vertrouwen te weinig voor. Dat zou dan moeten lopen via de kennisinstelling bijvoorbeeld.

***Participant***

Ja, maar dat je als overheid dat dan wel regelt, dat je iets kan aanbieden van oké, er zit een enorm grote transitie aan te komen, maar we gaan jullie een beetje bij de hand nemen en die en die hebben we daarvoor ingeschakeld.

***Interviewer***

Oké dus overheid zelf, die neemt dan niet per se die adviserende rol op zich, maar meer voor kennisinstellingen?

***Participant***

Ja dus die faciliteert. Die kan wel een faciliterende rol daarin spelen.

***Participant***

Ja *economic* inderdaad *sustainability*.

***Interviewer***

Ja, zijn daar nog aspecten?

***Participant***

Ja, ik denk ook zeg maar dat Oekraïne nu zo'n groot impact heeft op de prijzen en op de boeren. Denk misschien toch dat je dan wat meer moet gaan naar dat we in Nederland wat meer gaan verbouwen,

maar dat is dus weer lastig met emissies. Dus wat meer een kleinere keten noem je, dat denk ik [naam], toch?

***Participant***

Ja een kortere keten. Ja, maar dan, dan heb je ook weer dat bepaalde dingen kunnen gewoon niet. Is helemaal niet efficiënt om hier te verbouwen.

***Participant***

Ja, dat is heel lastig.

***Participant***

Maar je hebt wel gelijk dat ze binnen *economic sustainability* hoort ook dat hele internationale speelveld, waarin we leven.

***Participant***

Ja dat Oekraïne nu dan zo een invloed heeft. Als je echt helemaal *sustainable* wil zijn, dan moet je dat eigenlijk proberen te voorkomen of dat je meerdere leveranciers hebt zeg maar, dat het niet zo'n grote impact heeft.

***Interviewer***

OK, dus daar moet ook diversiteit in komen?

***Participant***

Ja dat je makkelijker de klappen kan opvangen, zeg maar.

***Participant***

Ja, en dat gaat dan niet alleen over het aanleveren, maar ook over het afleveren.

***Participant***

Door diversiteit, en... En, dat is aanleveranciers en je import en export.

***Interviewer***

Voor zowel import en export. En is dat de enige het enige aspect hoe jullie..., want Ik heb hier in internationaal speelveld en dat gaat in op de diversiteit van import en export is dus nog een andere rol voordat internationale speelveld in deze dimensie?

***Participant***

Ja, wat we nu zien, is dat wij in Nederland zijn heel goed in het opwaarderen van bepaalde producten, dus dat producten hier ingevoerd worden, vervolgens meerwaarde meekrijgen met de daarbij soms behorende negatieve effecten en dat het dan weer geëxporteerd wordt. En dan de burger, zegt van ja, maar wij gaan hier niet voor opdraaien. En dan kan je bijvoorbeeld denken aan de kalverhouderij waar. Kalfjes van buitenlandse melkveebedrijven komen, hier worden opgefokt, hier de mest en emissies hebben vervolgens weer doorgevoerd gaan worden. En dat, dat heb je in de pluimveehouderij ook wel iets, wel in mindere mate. Maar dan kom je ook gelijk alweer een beetje op *environmental sustainability*. Dat daar natuurlijk wel heel veel. Verlies bij komt kijken op bepaalde aspecten, maar aan de andere kant is ook wel weer zo dat wij daar gewoon heel goed in zijn. Dus misschien als het in een ander land gebeurt, is het verlies nog wel groter. Dus, dus dat is denk ik de uitdaging voor jou als je naast *sustainability* gaat kijken dat het... Nou ja, omdat te vergelijken van wat we hier hebben aan *sustainability*. Ja, wat betekent dat dan voor je voor andere landen ook?

***Interviewer***

Die onderdelen die elkaar kunnen beïnvloeden?

***Participant***

Ja en ik denk ook misschien inderdaad, nu zitten we in de EU, dus dat we zo vrij kunnen handelen. Volgens mij heeft dat enorme voordelen voor *economic sustainability* dus, maar dat valt misschien ook onder... Nee, nee, denk hieronder misschien.

***Participant***

Ja, maar dat zorgt ook wel weer voor ongelijkheid.

***Participant***

Hoe bedoel je?

***Participant***

Dat een Oost Europees land die wel in de EU zit, gewoon vrij kan handelen terwijl ze heel andere standaarden hebben dan wij, waardoor dus de prijzen totaal uit balans gaan. En waar ik nu ook over zat na te denken. Die *economic sustainability* is natuurlijk ook het ding dat wij niet alle delen van de kip willen gebruiken en dat dat dan naar andere landen gaat. Ja, hoe zou ik dat linken aan de *economic sustainability*?

***Participant***

Leghennen die wij niet willen eten.

***Participant***

Ja bijvoorbeeld.

***Interviewer***

OK, dus dat wordt geëxporteerd dan, die leghennen?

***Participant***

Ja klopt. Wij zijn eigenlijk té verwend.

***Participant***

Maar ook bijvoorbeeld de bepaalde delen van het vleeskuiken, die in Afrika bijvoorbeeld wel worden gegeten. Die worden ook allemaal geëxporteerd. Die soms daar dan weer voor een verstoring van de markt zorg.

***Participant***

Is het dan inefficiënt gebruik van het volledige dier of onvolledig gebruik van het dier? Misschien onvolledig gebruik?

***Interviewer***

Dan noem ik het zo.

***Participant***

Gebruik of consumptie van het dier. En wat ik ook zat te denken, was de reputatie van Nederland natuurlijk, want wij hebben enorm goede reputatie qua voedselveiligheid overal. En daarom zijn onze producten zo gewild. In het buitenland denken ze eigenlijk van nou, ik haal mijn eieren, maar uit Nederland, bijna, bij wijze van spreken, want dan is het gewoon veilig voedsel. Dus het is steeds goed onder de besmettingspercentages. Dus dat doet ons ook wel ten goede economisch gezien.

***Interviewer***

Oké, hebben jullie hier nog iets toe te voegen? Anders ga ik verder.

***Participant***

Nee denk ik niet?

***Participant***

Denk het ook niet.

***Interviewer***

We hebben het hier al net even kort over gehad over de institutionele duurzaamheid. En waar ik benieuwd naar ben is wie heeft of wie mag binnen dit systeem? Wie mag daar keuzes maken en hoe is het geïntegreerd, zeg maar, binnen de politieke context. En als we het dan hebben over duurzaamheid, hoe zouden we dat aan kunnen pakken?

***Participant***

Ja lastig.

***Participant***

Ja overheid staat hier al. Je hebt natuurlijk verschillende... De politiek heeft natuurlijk ook een... overheid en politiek is natuurlijk niet helemaal hetzelfde, zeker nu niet. Dus bepaalde beleid wat nu gemaakt wordt? Ja, dat is toch heel erg afhankelijk van het politieke gesternte dat er is en wat nu gewoon best wel polariserend is overall wordt tegenaan getrapt. Dus politieke partijen hebben daar best wel een hele grote rol in. Maar als je het hebt over instituties en denk ik ook de banken wel een hele grote partij die die sturend hierin zijn.

***Interviewer***

En wat? Hoe zou jij de rol van de banken dan omschrijven? Ook op de keten, of op het systeem?

***Participant***

Nou voor alles t investeringen vraagt komen de banken in zicht. Zeker als het gaat over de primaire productie, maar ook wel die bedrijven eromheen. Kijk, een deel kan altijd gesubsidieerd worden via, kan gefund worden via subsidies. Nou ja, dan heb je de overheid weer. Maar die banken die moeten toch dan nog een deel gaan bijdragen. En, die kunnen daarin wel maken of breken, kijk als die nee zeggen, ja dan, dan kan je weinig meer als individuele veehouder. En, die laten zich dan ook weer beïnvloeden door de politiek, dus wat je nu ziet, is dat...

***Participant***

En de consument.

***Participant***

Bedrijven die misschien wel een vergunning krijgen alsnog geen financiën krijgen.

***Interviewer***

En [naam], zei jij nou ook wat?

***Participant***

Oh ja, ze laat zich ook heel erg beïnvloeden door de consument, want als jij laat zien consument willen dit en er is goede vraag naar dan zijn ze natuurlijk makkelijker bereid om te zeggen, oké, daarin gaan we investeren, want daar hebben we vertrouwen in. Dus je moet een goed product kunnen aanleveren bij ze.

***Interviewer***

OK dus vanaf twee kanten, overheid en consumenten beïnvloeden wat banken doen.

***Participant***

Ja ja, en ik vroeg me ook nog even af [naam] van, want je hebt nu bijvoorbeeld dat staart couperen of, nee wat was het nou? Soms heb je dat in de politiek worden dan beslissingen gemaakt die dan gewoon niet worden doorgevoerd door de boer, dus daar zit ook nog wel een soort van mismatch. Bijvoorbeeld besluiten die dan niet haalbaar zijn überhaupt, zoals dan dat je dieren niet meer in hokken mocht houden? En ook staart couperen.

***Participant***

Ja, dat is inderdaad met die wet dieren, bedoel jij, die aangenomen is, maar die eigenlijk niet getoetst is op haalbaarheid wat de Eerste Kamer zou moeten doen. Dat is daar inderdaad wel een probleem in.

***Participant***

En ook staart couperen bijvoorbeeld dat ook door de overheid, dan is bepaald. Dus daar bepaalt dan de overheid, maar boeren zelf. Of instellingen zelf hebben ook natuurlijk een enorm grote stem, want die voeren het eigenlijk gewoon niet door, toch?

***Participant***

Nou, zoals zo simpel ligt dat niet, denk ik. Kijk, dat is een samenspel van... Er komt een roep vanuit dierenwel-..., daar hebben we het nog niet over gehad; dierenwelzijnsorganisaties die natuurlijk eigenlijk een grotere stem dan consumenten. Daar komt iets vandaan. Vervolgens wordt dat door beleidsmedewerkers die eigenlijk geen verstand hebben van de praktijk wordt dat verwerkt in wet- en regelgeving. Dat moet dan vervolgens door een Eerste en Tweede Kamer. Waar als het goed is, wordt gekeken naar de uitvoerbaarheid. En als dat niet gebeurt? Ja dan wordt zo iets aangenomen, komt het vervolgens weer bij medewerkers van ministeries die moeten ervoor zorgen dat dat dat uitgevoerd gaat worden. En dan komt men erachter dat dat niet haalbaar is.

***Interviewer***

OK, dus als ik haalbaarheid beleid hiertussen zet, is dat dan ongeveer?

***Participant***

Ja, ja, ik denk dat wel een hele mooie is. En wat je ook ziet is dat op een ministerie hebben beleidsmedewerkers gewoon wel echt een hele grote stem. Want bij verkiezingen dan wijzigt wel degene die bovenaan de voedselketen zit. Maar alles wat eronder zit, dat blijft gewoon zitten met hun eigen overtuigingen en ideeën. Dus die kunnen best nog wel een heel erg grote invloed hebben.

***Interviewer***

OK dus ergens die medewerkers waar jij net over had die bieden enigszins wel stabiliteit ook.

***Participant***

Ja, maar dan formuleer je positief en dat is het ook deels, maar het kan ook negatief zijn. Dat kan ook ervoor zorgen dat je blijft hangen in het oude.

***Interviewer***

Oké ja goeie. Oké, ja, ik zie dat de tijd aardig doorloopt, dus zijn er hier nog dingen die missen, anders dan ga ik door naar de volgende, naar *environmental sustainability*.

***Participant***

Misschien kunnen we hier de Europese Unie nog bijzetten, want er zitten tenslotte toch in een Europees project.

***Interviewer***

Ja heel goed. Ja dan als laatste onderdeel van de framing op *sustainability* die ik heb gekozen is dan de *environmental sustainability*. Hoe zien jullie dat, welke aspecten binnen en *environmental sustainability* zijn volgens jullie heel belangrijk?

***Participant***

Wet- en regelgeving dan toch? Ik denk dan aan emissies met *environmental sustainability*.

***Participant***

Ja, maar dan denk ik niet als eerste aan wet- en regelgeving.

***Participant***

Nou dat, ik heb het gevoel dat emissies is wet- en regelgeving komt daarvoor, en dat drijft boeren dan om te denken aan *environmental sustainability*. Omdat ze aan iets moeten voldoen, omdat ze emissies

moeten reduceren gaan ze innovaties doen met betrekking tot het welzijn van de wereld. Snap je wat ik bedoel, of is dat een onlogische gedachte?

***Participant***

Ik, ik snap wel wat je bedoelt, maar... Kijk, ik denk als het gaat over *environmental sustainability*, dan gaat het over produceren met zo min mogelijk schade aan de omgeving en ik denk dat dat dan niet wet- en regelgeving de grootste drijver is, maar dat dat de veehouder zelf is, die de passie, dat gevoel heeft bij natuur en bij dieren, enzovoort die daaraan bij wil dragen. Maar die daarin wel vastzit. Doordat ervoor betaald moet worden en dat mogelijk gemaakt moet worden en dan kan wet- en regelgeving en dan kunnen subsidies daarin helpend zijn. Maar ik zou niet willen zeggen dat als er geen wet- en regelgeving was op het gebied van emissiereductie, of milieutechnische dingen dat het dan niet zou gebeuren.

***Participant***

Weet ik niet. Of je moet dan dat de consument heel erg daarop aanstuurt. Dat de boer daar moet veranderen of dan dus met een richting, want zo'n *investment* al helemaal, als je het hebt over machines dat moet zich ergens in terugverdienen bijna of [belonen], bedoel ik.

***Participant***

Ja, maar dan maak je het gelijk heel groot als je even klein kijkt wat zijn emissies dan is dat inefficiënt gebruik van grondstoffen. En daar doet een veehouder sowieso altijd alles aan om dat te voorkomen.

***Participant***

Ja oke ja ik kijk dan inderdaad misschien wel heel groot, daar heb je gelijk in.

***Interviewer***

[Naam] jij zei: emissies zijn eigenlijk inefficiënt gebruik van grondstoffen?

***Participant***

Ja. Dus als je bijvoorbeeld hebt over ammoniakemissie dat is doordat niet alle eiwitten die gevoerd wordt, ook wordt gebruikt door dier.

***Participant***

Maar als je dan kijkt naar efficiënt gebruik van de grondstoffen. Soms worden grondstoffen te efficiënt misschien gebruikt, waardoor je misschien uitputting krijgt van het land of dat er op het land dan geen ruimte is of minder ruimte is voor natuur.



***Interviewer***

Oké, dus daar moet wel een balans in zitten?

***Participant***

Ja.

***Participant***

Kijk, ik heb het over het efficiënt gebruik van grondstof in het dier, dus wat hij gebruikt en jij hebt het dan inderdaad over de manier van telen van grondstoffen.

***Participant***

Ja inderdaad, dus we maken efficiënt gebruik van grondstoffen in het dier. Maar wat ik inderdaad bedoel is inderdaad efficiënt telen dat het soms te efficiënt is en dat we heel graag zoveel mogelijk uit de grond willen halen die we hebben in Nederland. Dat er daarom dan dus minder oog is voor natuur. En dat je misschien ook je grond kan uitputten, maar daar zijn boeren wel vaak bewust van dat ze roteren met hun gewassen.

***Participant***

Ja en daar zijn boeren zich bewust van, want die hebben weinig aan als een grond uitgeput is.

***Participant***

Klopt ja, maar, maar ze zullen minder snel een boom plant of zo. Als je het hebt over *environmental sustainability* en je zegt van goh: plant jij even een boom in je land, zeggen ze nou, weet je hoeveel dat me kost?

***Participant***

Nou, dan zeggen ze is dat wat *environmental sustainability* is, dan zeggen zij, kijk, dat is maar net hoe je het... Wat je vindt wat natuur is, en wat een goede biodiversiteit bijvoorbeeld zou moeten doen, want misschien zorgt die bomen wel voor dat er een bepaalde dieren die er eerst waren wel weer niet zo graag daar zouden willen leven. Dus dat is een hele ingewikkelde.

***Interviewer***

Dus ergens oh, sorry als ik hoor wat jullie zeggen dan. We moeten ergens ook een overeenstemming zijn in wat duurzaamheid en biodiversiteit betekent tussen verschillende partijen.

***Participant***

Ja, ja, maar, maar dat is dat... Proberen ze nu bijvoorbeeld bij het landbouwakkoord en dat gaat nog niet zo soepel.

**Interviewer**

Is nog niet gelukt? Oké, ik zet hem er wel bij, want ik vind het wel een hele interessante, want dat is ook een beetje wat ik zelf probeer te doen, maar ik onderbrak jullie.

**Participant**

Ja, ik was zo benieuwd wat jij dan *environmental sustainability* vindt [naam].

**Participant**

Ik denk dat ik daar niet zo een pasklaar antwoord op heb.

**Participant**

Want ik vind echt dat het te doen heeft met de hele wereld en een beetje zorgen voor de wereld komt er in mij op. En wat ik dan denk is van, je hebt ook dat dat... hoe noem je dat ook alweer dat natuur inclusief boeren, maar dan een Engelse term is daarvoor met bomen enzo.

**Participant**

*Agroforestry*, bedoel je?

**Participant**

Ja dat ja. Ja dat dat komt meteen ook bij mij in mij op en we hadden ook partners die dan dus ook die daar heel erg mee bezig waren met *agroforestry* en die vroegen dus ook op [...] van hé, waarom zou je hier een boom neerzetten, of juist niet? Waarom wel/niet? En toen zei zij dus van ja, weet je hoeveel dat allemaal kost? Dat ga ik echt niet doen.

**Participant**

Wat je inlevert op inefficiëntie met bijvoorbeeld de machines die je gebruikt. Wat je vervolgens allemaal met de hand moet gaan doen.

**Participant**

Ja klopt.

**Interviewer**

Ah dus als je nieuwe innovaties, als ik *agroforestry* maar zo kan noemen, dan heb je, ga je eigenlijk ook impact hebben op de efficiëntie en op hoeveel je kan verdienen als ik dat goed hoor of?

***Participant***

Ja, dat zijn beide wel zaken die daar mee spelen. Ja, en je hebt veel meer land nodig. Wat ook niet perse voor het oprapen ligt.

***Interviewer***

Ja, want eigenlijk wilde ik ook nog heel even met jullie gaan kijken als jullie dit redelijk compleet vinden, wat dan de belangrijkste *trade-offs* zijn om het maar zo te zeggen. Dus als je kijkt naar de post-its die we hier hebben staan en ik heb al gehoord dat jullie die ook een beetje hebben genoemd in jullie discussies net, maar waar jullie heel erg duidelijk zien welke elementen elkaar beïnvloeden.

***Participant***

Misschien kunnen we dierenwelzijn nog ergens kwijt, hoort die bij de *social sustainability*?

***Participant***

Ja ook ja.

***Interviewer***

Dierenwelzijn, ja. Want jij [naam], jij noemt dierenwelzijn. Heb je dan al meteen het idee dat dat impact heeft op iets anders wat we hier hebben staan?

***Participant***

Dat kan, dat kan zeker zo zijn, dus even kijken, als je het hebt over emissiereductie dan komt er bijvoorbeeld best wel wat emissies uit het strooisel in de pluimveehouderij, dus zou je heel makkelijk gezegd is het om emissies te reduceren, dan zet je ze allemaal weer terug op de kooi. Terwijl we dat voor dierenwelzijn niet echt perse wenselijk vinden.

***Participant***

En, dat is ook echt inderdaad nu een heel veel besproken onderwerp: dierenwelzijn met nieuwe zienswijzen en zo.

***Participant***

En ik denk dat *economic sustainability* toch wel in heel veel dingen terugkomt. Ja ook met *environmental sustainability* zie je van goh, hè wat haalt de boer eruit in efficiënte productie? Het heeft allemaal te maken met eigenlijk hoe die verdient en of dat hem dan ook wat oplevert of haar. En zorgen voor de wereld heeft denk ik ook te maken met *social sustainability*. En meer animo van burgers heeft dan te maken met *institutional sustainability* met hoeveel banken dan willen investeren, want als er veel animo is, dan willen banken ook sneller dat ze zeggen van nou, het voelt veilig om

hierin te investeren.

***Participant***

Het sociale netwerk en het vertrouwen in de overheid hoort bij elkaar. Ja vind ik wel, het heeft wel invloed op. Ja en de haalbaarheid van het beleid heeft, denk ik met alle drie die dingen te maken met milieu, met sociaal, met economisch.

***Participant***

En dierenwelzijnsorganisaties met dierenwelzijn. En plattelandsontwikkeling misschien met kennisinstellingen, want die zijn daarop berust, of hoe noem je dat? Die hebben dat nodig. Je hebt kennisinstellingen nodig voor ontwikkelingen.

***Participant***

Ja, maar ook de overheid.

***Interviewer***

De plattelandsontwikkeling en de overheid?

***Participant***

Ja voor financiering.

***Participant***

Maar ook een visie daarop. Waar wil je dan heen met zijn allen?

***Interviewer***

Nou, ik zie dat we redelijk aan het eind van de tijd zitten en ik zou heel graag met jullie ook nog even naar de naar de doelstellingen willen kijken. Als we zo meteen nog echt hele belangrijke trade-offs tussen zitten, dan kan je dat altijd benoemen. Maar voor nu wilde ik nog even kijken naar doelen en dat zijn doelen voor de sector en dan in als eerste in termen van hoe..., hoe zouden we dit systeem meer bestand kunnen maken tegen schokken van buitenaf?

***Participant***

Dan heb je denkt om vooral te maken met die diversiteit dat als een wegvalt, dat je dan naar de ander kan.

***Participant***

En ik denk dan ook gelijk aan een goed verdienmodel, zodat je ook ruimte hebt om te bewegen.

***Interviewer***

Zet ik dan alvast even hier [viability].

***Participant***

En dat de overheid achter je staat dat als er een keer een grote klap is, dat ze het belangrijk genoeg vinden om de boeren te steunen. En misschien ook wel een diversiteit in werkzaamheden dat je zegt, ik heb een boerderij, maar ook een Airbnb of zo. Dat als de boerderij minder goed gaat dat je dan meer opbrengsten kan halen uit de Airbnb?

***Interviewer***

Ja, oh, dan zou dat, dan zou dat ook terug kunnen slaan op die goede verdienmodellen, eventueel zelfs nog.

***Participant***

Maar dat kan ook, ja? Dat heeft toch ook weer verschillende kanten. Je kan natuurlijk ook, dat hoeft geen eens iets buiten..., iets uit een hele andere tak te zijn. Je kan natuurlijk ook hebben met twee diersoorten dat je als de ene sector wat minder gaat, het opvangt met de andere. Maar dan... Ja het zorgt ook wel weer voor risico's en dat is met een tweede bedrijfstak, zoals bijvoorbeeld een Airbnb, is dat ook als ik het even betrek op de pluimveehouderij. Nou dat je toch een heleboel mensen op je bedrijf laat, wat dan weer diergezondheids... [...]

***Interviewer***

En jij noemde ook ja, verschillende diersoorten houden?

***Participant***

Varkens en kippen bijvoorbeeld. En wat ik ook nog dacht, is dat je natuurlijk kan aansluiten bij een grotere organisatie, zodat je zelf als een boer misschien wat minder vatbaar bent voor de klappen als eigen ondernemer. Maar dat brengt natuurlijk ook weer nadelen met zich mee als je aansluit bij een grotere organisatie.

***Interviewer***

Zo, maar dat zou eventueel wel kunnen helpen om meer bestand te zijn?

***Participant***

Je hebt nu bijvoorbeeld de Unie voor Pluimvee Producenten die dan gezamenlijke inkoop, en verkoop van eieren en pluimveevlees doen.

***Interviewer***

Als we dan gaan naar het tweede onderdeel, dat gaat over *viability* en misschien hadden jullie het al een beetje door, gaat erover, hoe kunnen deze bedrijven in ons economische systeem zo weerbaar mogelijk zijn? Dus dat gaat echt in op de ook heel erg op de financiële kant. Wat zijn daarin wat zouden daarin voor jullie een aantal belangrijke doelen zijn?

***Participant***

Ja dat het mooiste zou zijn als je niet echt afhankelijk bent van extern geld.

***Participant***

Ik vind hem veel lijken of *resilience* ook.

***Interviewer***

Ja, het gaat ook vooral om, dat de verschillende dynamieken in het systeem om daar ook inzicht op te krijgen, van waar moeten we nou naartoe werken? En als daar dezelfde doelen in staan, dan is dat prima.

***Participant***

Maakt dat wat makkelijker? Ja, ik zou dan zeggen: steun consumenten en overheid, maar dat hadden we net ook wel een beetje.

***Interviewer***

Ik schrijf hem toch op: consument en overheid, oké? Ja en misschien dat jullie hier ook bij dat laatste blokje ook hetzelfde gaan vinden, maar dat zou er echt om gaan over hoe je het systeem van binnenuit eigenlijk zo sterk mogelijk kan maken, hebben jullie daar ideeën bij?

***Participant***

Misschien bedrijfopvolging aantrekkelijker maken.

***Participant***

En ik moest denken aan een stabiele afname. Bijvoorbeeld door supermarkten of zo dat je daar goede regelingen mee maakt.

***Interviewer***

Nou, in dat geval hebben we echt al heel veel kunnen benoemen in dit uur is er nog iets waar jullie vinden dat dat we gemist hebben? Want dan kan ik dat er nu nog bijzetten.

***Participant***

Ik vond het wel goed dat het [naam] dierenwelzijn noemde, want die wordt vaak vergeten en dat is wel een heel belangrijk aspect.

***Participant***

Je hebt al een interview gehad met [dierenwelzijnsexpert] dus ik denk dat dat daar wel ter sprake is gekomen.

***Interviewer***

Ja, dat klopt. Ja als jullie verder denken van nou, dit is voor mij nu relatief compleet dan stop ik met delen van mijn scherm.

**Appendix B.4: Interview 4**

***Interviewer***

But first, yeah, I'm not sure about in how much depth we discussed this last time, but as you know I work together with [names] on work package 8 and you're involved in that process as well. So, you know about the alternative, the future business models that we are trying to develop. Within the work package there was also the requirement that there was a need for a sustainability assessment for these business models. And however, what I found is that you know, as these are future business models, they cannot be assessment [on sustainability] by the more traditional approaches who are oftentimes quantitative in their approach. And because the knowledge about those future business models might be limited and we need a different approach. So, what I'm trying to do with these interviews is I'm trying to get insight in the context of and Code Refarm and the state of sustainability challengers or what goes right in the sustainability surrounding these goat and poultry farming systems. In this I would like to have a very broad view, both on sustainability and the farming system in general, but you have also been involved in that process, getting insight in the farming systems. What I'm going to do is I'm going to show you..., I'm going to share my screen. Can you see the tool?

***Participant***

Yes, yes.

***Interviewer***

Great, because there's actually two things I am trying to do within this interview. The first aspect is the sustainability framing of the farming systems, and for you, this will probably be the Code Refarm

farming systems as you studied them. But I'm trying to get insight into social, economic, institutional, and environmental dimensions of sustainability. Oftentimes, these environmental dimensions are very well defined, but what's social, economic and institutional sustainability is that's often not a very well defined in these tools. And in addition, because I'm I try to fill these in in collaboration which you, find where the synergies and tradeoffs are. And then when we've mapped this, I want to go to the second part and that will be about the sustainability goals for this farming system and there will be in terms of resilience, viability, and stability of the farming system. And because of that, hopefully I can see where we can work towards within the sustainability assessment.

***Participant***

Makes sense.

***Interviewer***

And could you tell a little bit just for the record about your involvement?

***Participant***

Yes, I work for the Cyprus Research and Innovation Center. We are coordinating Code Refarm, so my role is to mainly support with the coordination activities, but also I am involved in the broader aspects of work, package 8. And the work we do there and as well as the branding of the project and also the transfer of the project to a broader audience other than the consortium and the direct stakeholders. So those are the two main aspects of the project that I am directly involved in alongside my overall project management role and coordination.

***Interviewer***

So you can both probably offer perspectives from within the farming system, but also maybe toward or you said with the marketing, communicating towards outside.

***Participant***

Umm, yes. I mean to an extent because I think more equipped people belong in the consortium that can give a better understanding of the farming system. Since I I'm not a an animal technician or an animal expert by any means, and I have looked at this alongside the University of Eindhoven in terms of the business aspect of what we're trying to do in the project and the developments in work package 8 and within those activities, I did gain an understanding, a better understanding of the farming sector for goats, the dairy goats. Mainly because I had the opportunity to speak to farmers and direct stakeholders as part of the activities of task 8.2. So my knowledge and expertise and understanding



broadly derives from those activities, but also from my own research and of course with the whole coordination and development of the tasks and the activities in the in the project.

***Interviewer***

Yeah, yeah, sounds great. So you have a very good overview on the things that are happening. So that's great. Then I think we can dive directly into it. And well, actually my first question for you and it's pretty broad question, but what do you and have you seen to be considered sustainability in the context of the goat farming system?

***Participant***

I think in general, when we do introduce the terms sustainability to, especially farmers and people who work directly with the animals is, a large part of that, if not most of it has to do with economic factors and financial factors. So. Because farming is, in a sense, a dying art of our days, they are very much interested and concerned about sustaining their business financially, as well as considering environment and institutions and the social sustainability or what we call a social acceptance in in many cases. But I think main focus when we talked to them about sustainability is the finances.

***Interviewer***

So, the finances are most often for the farmers themselves one of the main criteria.

***Participant***

Personal financial growth, but also business growth. But in a financial concept like to see that the business is sustainable, it has to make money. And if that's not shown as much as you try and as much as you give in to it, and as much work as you put in in terms of labor. Unless that has an impact in the finances there is questioned whether that's sustainable or not. If it makes sense.

***Interviewer***

So if I can summarize it a little bit, it's like the interplay between the amount of labor that goes in and if it's financially feasible to make a living out of that.

***Participant***

Uh, yes. Yes, but also. How much does it provide in terms of finances when you take out costs and increasing costs and the other aspects of the business and how much it is profitable and prudent, and it makes sense to continue doing something that doesn't bring a financial value for the long run. So these are concerns, of course, but you're asking about sustainability and in terms of the people I have spoken to, the main concern that is linked with what we call sustainability is directly linked to the financial gain and financial growth and company growth as well.

***Interviewer***

So what we see as sustainability should also..., a farmer should be able to make a living and need to grow their business.

***Participant***

Yes.

***Interviewer***

So yeah. And what do you..., because you say what we see as sustainability and what farmers see... What we see as sustainability; could you explore the, explain a little bit more?

***Interviewer***

I think that when you work with different elements, and one of them is policy and regulations and directives, and science. You see, there's a sustainability in a from a different point of view without necessarily thinking of the actual ways of making a business sustainable because you consider of all this theories and the theoretical aspects of it. But in practice it might be different, so I'm saying we and them in terms of researchers and the actual people running businesses in this areas, in these industries. And I think there's a gap in understanding the same thing when it comes to sustainability. And the other complication comes from what I said earlier about the introduction of policies, introduction of regulations. Yes, it is a controlled and regulated sector, but it's also a rather free sector in a way, for a lot of the farms that are smaller, maybe updates on policies and new regulations do not reach them as fast as they should. So that aspect of sustainability sometimes lacks when, this is my experience, from when talking to directly to farmers, mainly not so much other stakeholders, but directly to farmers. So yeah, I think that there is this gap and I think that whenever we try to introduce a term such as sustainability or any other element like that. It's important to lay some rules and develop something that we all understand in the same way.

***Interviewer***

And let's see the I'll put that near social sustainability or institutional. So common ground on the definition of sustainability. OK, great. Let's..., Then I'll move quickly over to the environmental sustainability pillar. Because you have addressed a little bit the policy side of sustainability and there are a lot of policies, and I assume they will also feed on what's environmental sustainability is, but if you look from your own perspective to the current farming systems, what would then be, in an ideal world, what would environmental sustainability, what would it look like?

***Participant***

I think figuring out... This is my personal opinion: I'm not gonna talk about the farmers here. But I think that delivering something, at least the way we found it. Instead of degrading it and farming can do that to the environment. So if we can find ways of at least maintaining the level of environmental sustainability, yes, but the level of non-degradation to the future that that will be ideal. Because a lot of the things we cannot fix we did a lot of bad to the environment and deriving from extensively farming the world. So we should also be realistic. A lot of these degradation factors are irreversible, but we don't need to make things worse. Is what I'm saying.

***Interviewer***

Let's see, if I, for example, write this down as stop irreversible damage. Is that a little bit what you're referring to?

***Participant***

I'm going a step before that and saying to stop it, we have to find the ways to stop it. And yes, policies and regulations is a part, and of course we know by now that unless you introduce punishment for certain things, people don't react immediately to them. But I think there needs to be a lot more proactive work before introducing policies so that they're actually impactful. So to me it's not stopping the degradation that should be the outcome, but setting down the processes to allow that to happen is what is important.

***Interviewer***

So not necessarily looking at it from an end goal perspective, but also how we get there. And let's see, because I think that kind of relates to the institutional dimension. Do you have a vision on those processes for yourself?

***Participant***

Umm, I think that for a lot of things that are happening in the world, we do have this problem that we think of the end result, and we think of what we should have and what we should be doing without thinking of how to do it. And I think that is a problematic and starts from the institution. Because the institution is the one that is supposed to lay the ground and lay the rules and give the steps of how to reach that end goal. You cannot be coming to somebody and telling them you have to do this, but not giving them any insight as to how. So, in terms of institutional sustainability, I don't think that there's a problem with institutional sustainability. I think they're very well sustained institutions and unless there are massive changes in the way we see what we call institutions, the sustainability is there, it will be maintained. There's no question about it. It's just a way of how you use the power of an institution, of institutional power in general. To get the information to formulate this processes, then implement the processes, validate them and then meet the end result. The wishful end results.

***Interviewer***

And do you think there..., in this institutional dimension that there is also a role for the farming system to at one point, or at a certain point, have influence the decision-making process from some kind of institutional dimension or?

***Participant***

I can't think of anything on the top of my head where that happened, but if that happens, it would be great because from experience we need to understand, we [as] the world, we need to understand that this whole idea of people sitting at the top and then giving instructions to the rest of them down below is very problematic because they have no actual understanding in many cases and any actual view of what is happening on site. So, the only reason the only way to move forward and change these institutional barriers, because I think they're barriers is to include all the different people, co-create solutions together with the people that are actually going to implement.

***Interviewer***

So co-creation and then, less top-down approaches?

***Participant***

Yes. I think more agility as well, having the decency in many cases to say that yes, that was wrong we need to do it again. Let's do another round. Instead of having this idea that whatever the regulations and the institutions and the academics and whatever, everything they tell you is that actually 100% correct all the time, which is not. And everyone needs to take that responsibility and instead of just shutting things down because they didn't work, just finding new ways to make them work in an agile way, more iterations of the same thing might help.

***Interviewer***

So more freedom to experiment with alternative business models?

***Participant***

Absolutely. And more on the lessons learned. For a lot of the European projects I work in, we have this long list of lessons learned. But do we actually use them as lessons learned? [Answer: no] And that is the problem with a lot of things and a lot of industries we document, these things we realize that there were mistakes, but how much do we consider them when we start redoing a process or redesigning or remodeling something. So, all of that together, I think comes under the institutions and their sustainability, which I do not think that they have a problem sustaining. But, generally.

***Interviewer***

So yeah, that also really nicely relates to the farming systems. Well, great. And then I want to go to the social dimension of sustainability. And it's also that's the dimension that has not been defined very clearly in literature. So on the one hand, you can say it's really on the farm level. On one hand, you can say it's business ecosystem level, or for the broader society, just to from your perspective. But if you look at this social dimension of sustainability and what you've learned so far. What are important issues to make this farming system more sustainable in a social way?

***Participant***

I think it's again the different movements, the animal rights, the vegan movement. But these are things that came up in, in discussions with the stakeholders as well. And it was actually eye opening to discuss about them because they are..., most of them are rooted in very, very nice and very good defined frameworks, but some of them go beyond what is reasonable. And in occasion they are not directly supported by any actual science. Whether that's natural science, health, science or social sciences. So we've noticed when we were doing this exercise that there's a lot of claims that are being out there that drive the society, but because society changes so much and they're just being fed information in most occasions without questioning what they see. That has also changed the societal view of the farming system without always being the correct or..., without giving the correct image of it so. That's a factor that that derives from society. That's why I'm mentioning it here mostly. Another thing that maybe drives, not maybe, but drives society as a whole, and it has an impact on social sustainability, I believe, especially when it comes to farming and the products, because in Code Refarm we talk about derived products as well; is the cost and the cost of living in general. With the increased cost of living a lot less people are willing to pay the price of the animal product and we've seen that when we did the interviews. So, there are different elements that of course [...] of the world do formulate these changes in society. And whether that's consumer habits or market or whatever you wanna call it, that is derived by society and that is part of the social sustainability of the farming system as a whole.

***Interviewer***

Yeah, so the view of society or the farming system impacts the social sustainability, yeah.

***Participant***

Yes. And one last thing here is also the impact of technology. We've seen that and I think it was [name] who introduced this with some alternative chicken factory or something that she did in, in her interviews. And then I want in to search a bit more.

Whenever we've seen that, if you provide information that you are technologically advanced in your [premises] as a farmer, not necessarily a big farm with automated processes, but if you incorporate

technology for different things, it divides the consumers into two because you have those that are completely traditional and now want everything done by hand, grass fed, you know not processed and you want the other ones to say that but we have all these tools and all these technologies now, and we can actually use them so that we make products safer. So we have seen this gap and this division between the consumers when it came to the social perception of the product and where it comes from.

***Interviewer***

OK, so, social perception of products?

***Participant***

Social perception of where the product comes from.

***Interviewer***

Anything to add to the social sustainability otherwise?

***Participant***

I think I spoke too much about social sustainability.

***Interviewer***

Ohh, that's only very nice because that will help me in the in analysis, so that's great. Then I will talk about the pillar of economic sustainability, because you mentioned in the beginning that's a very important factor as you have seen. If you look at the current farming system and its economic sustainability, what would it look like in a perfect world?

***Participant***

Well, for the dairy goat sector, the fact that the prices for feed are so high, it affects the sustainability of the farm as a business. So again, all these different things that are happening in the world, the war in Ukraine, the war in Sudan, now the climate's degradation impact and what that has..., the farming areas that we can actually farm because of the climate change. All of these things affect the economic sustainability of a business and of course of the farming system because when you look at the way animals live in an environment with these changes it's different to what it was 50 years ago.

***Interviewer***

And then you did just also take an animal perspective, from an animal that it changes in these farming systems?

***Participant***

Yeah, I mean, with all these changes, there are considerations as to how you grow your animals. So that also has usually financial impact because of the feed, because of the way you need to water your animals, because of the different analysis you have to perform. You know all these different additional costs that are cost to the business and you cannot necessarily charge for or get back from.

***Interviewer***

So in that sense there may be some need to grow animals in light of these changes.

***Participant***

Yeah. You these are things that need to be considered. I think in the long run, I'm not sure if this is the way to go about. I'm not an expert in that, but I think that they need to be considered if we want to sustain a business as a whole, or expand it, or develop it. Or, take it a step further than what we have today.

***Interviewer***

Do you feel like this is more or less complete now, the economic part?

***Participant***

Something that can potentially be beneficial I think, and feed towards the economic sustainability is of finding ways to engage younger people in this sort of work. Because I remember when we were discussing with [name]s about what they did in Netherlands with the chickens, it was because of the agricultural colleges in the Netherlands and the structure of the country and how you see farming in general. It was different to what we have experienced and what we see every day actually here in Cyprus as well, where younger people less and less want to do this kind of work because they do not think that it has any benefit to them. The benefits of such labor is not are not directly provided to them, and it's easier to say that they're not going to do it. But I think that if younger people are trained and if younger people are informed about the actual farm and the farming systems and the way a farm works and sustainability in general, and how technology can elaborate, within the processes, I think that a lot more people would be interested in this. And that they would engage a lot more. And that that would also fit on the economic sustainability of the business of the farm, but also the business. For instance, in Greece and in Cyprus, where we interviewed a lot of farmers, we had a repetitive, recurring theme coming up that we have seasonal workers that come here, they learn what they need to do and then they go. So we have a huge turnover and that keeps happening and but if you have family or local staff that you can train to do this in the long run, then that can only be beneficial for the company as well, for the business as well.

***Interviewer***

So there's also a need for the for the employees, you know, to keep the knowledge within the farming system, instead renewing [everything]. This is a really nice picture I have here, and do you feel something's missing? Do you think do you feel like within you haven't been able to talk about some issues within these four dimensions?

***Participant***

I think it's pretty much all there. I think that if I had to put a hat over everything, it would have to be governance and policy, if I'm honest. What covers all of this. Yes, the economic and financial is the main idea. But the things that governs this is actually policy and regulation, because we are all under the greater European family, let's call it family. There's a lot of misconception as to a standardized policy that is happening in Brussels that has to be applied in regions like here in Cyprus or in Denmark or you know, different areas in farming, climate and areas are very important. And I don't think that they are considered to the extent possible. And I think that is what creates several mishaps when it comes to applying and implementing these policies and obeying by these regulations as well.

***Interviewer***

Would you say that's a translation issue between...

***Participant***

I think it could be, but I think the main problem is that we need to understand that yes: we can have a common root for a regulations and policies, but they also have to be tailor-made and custom-made to the local areas. And I think that that is not done to the extent possible and I'm not the one to educate our officials in the European Commission or the EU in general, but we need to accept the fact that we cannot call European policy one [feed?] for all; regulation and policy and application, because that will never be sustainable.

***Interviewer***

Let's see, because what I want to do now is with you is because..., within this image. I want to try to see if we can find and some synergies and some tradeoffs between the elements you have here. Because what oftentimes is happening, within sustainability assessment tools, they only focus on the issues that are synergies so that will mutually reinforce themselves and make sustainability better. But sometimes negative tradeoffs are not discussed, so I will.

I would like to ask you if you look at this image and you look at everything that's on it, do you see a few items where you think: these might have a positive or negative influence on each other?

***Participant***



I think technology can have a positive impact on environmental and economic sustainability, even though we have added it to the social sustainability. Definitely to the environmental and economic sustainability, I mean, I don't think there's anyone that kind of questions that. For the institutional sustainability as well because if we think of the different elements of technology, the tools and how much that can be applied and to what extent, I think that technology is the answer that links all of these things together. But also. What I say below about the lessons learned, I think that the lessons learned and assist with the environmental sustainability as well as the economic sustainability. For the social sustainability I would say that it's a back-and-forth relationship. So yes, you focus on, you look at the lessons learned and you link them to social sustainability, but also the social sustainability and society can fit into lessons learned and you keep a loop of learning new things and readapting them.

***Interviewer***

So it's a matter of iterations [...] Let's see, sometimes I cannot get it to work properly.

***Participant***

I hate miro. When [name] had me doing the other ones here, I had my [...] help with all this because I'm really not good with these things.

***Interviewer***

Yeah, I'm struggling sometimes with the linking. I'm glad that I have the transcript to help me if it doesn't work. So, let's see if I have the links. And maybe between other items, because you've now mentioned a continuous learning, focus on lessons learned.

***Participant***

Co-creation and agility can definitely be beneficial to and possibly together. Co-creation following agility can be beneficial to definitely social sustainability and social understanding of a lot of things. But I think that it can also fit into economic sustainability. And why not environmental sustainability as well? If you if you consider all the elements possible, so yeah, I would definitely think that those can be linked to the other two.

***Interviewer***

And let's see, because we're now focused on the pillars as a whole, maybe between the nodes or the post-its? Or maybe anything that you think might interact with each other?

***Participant***

Yeah, I think the common ground on what we call sustainability, which is under social sustainability, there is definitely linked to the processes. The different processes in in the environmental

sustainability, but also institutional sustainability. So a clear understanding of what we're trying to achieve in the end would benefit the other pillars as well.

***Interviewer***

Yeah, absolutely. So we need, we need to have the common ground [...] benefit each other?

***Participant***

I'm just going to move screens because I'm using my laptop screen because my camera is there. OK I have a big screen now I can see everything. I think, what you pointed down as policy and regulation as part of the institutional sustainability, is actually linked to the 'tailor-made to the local area'-part in the same in the same pillar and it also affects the economic sustainability with pretty much all of those posts-its on an economic sustainability, but may mainly the factors outside of farming systems. So. I think those are directly linked and as well as linked to the new ways to allow...

***Interviewer***

Do you still hear me? Because I just lost audio.

***Participant***

I have a thing here that I actually pressed. I'm sorry about that.

***Interviewer***

That's OK. What were you discussing?

***Participant***

I would also link the 'tailor made to local area' from the institutional sustainability. I would also link that to the environmental sustainability in terms of the degradation of the environment in general in an area.

***Interviewer***

Oh, yeah, these are intertwined, OK. Do you feel this is complete? Otherwise, we'll move on to the to the second part.

***Participant***

I think it is. Maybe I would also link, what we just linked to the environment, to the change of societal view. Again, this has to be done in a tailor-made way because not each area has the same type of society in a way so that that should also be considered, yes.

***Interviewer***

So this link yeah? Great. There are really interesting tradeoffs of here and I I assume they will be very beneficial to visualize, in the sustainability assessment tool. Let's see. So not only do I want to understand what is sustainability in this farming system, I also want to address more the system dynamics and the goals to make the farming system resilient, viable and stable and if you could name one or two, maybe three goals where we should work towards to make the system more resilient, for example. And when I say resilient system; that mostly focuses on the ability to withstand outside shocks. For example, the example you had with the wars in Ukraine and Sudan, you mentioned, it could also be a climate change. It could also be a the [capitalist]... You know, if anything happens with the banks. Do you maybe have some goals on and on how we can make this system more resilient.

***Participant***

I think in terms of sustainability again is... It may sound very evident, but finding ways for the business not to be affected by external factors like creating, in a sense, creating a smaller ecosystem that controls the processes on the outside. So I think that can make a system more resilient. Also, again from the people I have spoken to that are directly linked to the farming sector. The ones that seem to do better and are more resilient are seem to be the ones that take on a lot of the processes themselves, like they create the feed for their animals, they make the cheese for their animals, they are not part of a chain, but they are the whole chain themselves, in a way. Possibly. Not including retail or wholesale or anything like that, but the whole production line is done on in one place. So that might be... I don't know if that's the answer for the future to be making this more resilient systems. But as I said, we've spoken to a lot of people, a lot of farmers from Greece. And as you probably know, Greece underwent a huge financial crisis multiple times in the last 20 years. So we have found that the people who have actually taken on doing all the processes in the chain themselves are the ones that have actually survived these changes. So it's not only a case of a matter of removing the middleman in many of these cases, but it's also taking on reshaping, remodeling your business to be taking on something that was not initially intended for your business, but you cut a lot of cost there and you make yourself more resilient. So we, we've seen that. We've documented that when we spoke to a lot of the farmers, especially in Greece.

***Interviewer***

So, OK, we have two ways to make the system more resilient. Then if we go on to viability. I'm looking for certain goals for the system that make it viable in an economic way.

So do you see maybe some goals or some steps that we could take for the future to make the farm system..., to keep the system economically viable for everyone who's in it.

***Participant***

I think this will vary. This is my personal opinion. I think it will vary between farming sectors, but my initial thoughts is that the expansion of the farm might make it more viable the bigger the farm the more viability in terms of finances. Which is partially the main... Well, partially one of the goals that all these business owners have expressed. They see the expansion of their... making their farm bigger or getting more animals as something that would make the business more viable. In mathematical terms, with all the costs that they have to pay, this may not be viable. However, this is the perception. So it is a bit tricky to answer that because I have these two very different pieces of information that are contradicting, but this is the main perception from the people in the industry.

***Interviewer***

And that's the perception of mainly the farmers then or also from the rest of the people in the business ecosystem?

***Participant***

Um, no. When we talk about the farms, it's mostly the farmers and because the other stakeholders... We spoke to were cheese mongers. Some of them have their own animals, some of them don't, they get milk from others. The more milk they get, the more cheese they make, but that doesn't necessarily affect their... They don't have any farming practices as such to consider if they're just getting the milk from an outside farm. The animal farm, we did not discuss any anything at farm level, which is surprising, but it's true. And the veterinarians and the animal experts that we spoke to have sort of divided opinions based on their experiences and the interactions they have with the farmers themselves. But I can't really speak of that because we didn't go into depth about what we call viability in economic terms. I'm sure the animal experts that you will interview will give you a very good idea of that.

***Interviewer***

OK, so for now I'll just assume that there are divergent opinions on it and but from your perspective you've mentioned expansion. And just to make it clear for myself, with expansion you do not mean intensification?

***Participant***

No, I mean more land, more animals, not same land, more animals, you know.

***Interviewer***

It is *and-and*; and more land and more animals.

***Participant***

Ah, yes, yes, perhaps. In a way, because we looked at this from the perspective of an end product; of cheese for instance, or goat milk. The production, if you can enhance the production and the rate of production usually with the use of technology, some of them have done that in the past five years or so, and they have seen an increase in their finances. So that might be another, I don't know. I'm a bit skeptical to talk about viability for farms, as I'm not directly linked to them, so I'm trying to, you know, remember what everyone said and give you a general idea of what I heard.

***Interviewer***

No, that's perfect, because that means that there are a lot of different perspectives also for in this meeting because you've met with a lot of people already. OK, so I just added improved production through technology in this part, and I saw that we have 5 minutes left. So then I say, let's go to the final system dynamic part and that's stability and that's how can we make the farming system from the inside more stable. So, we looked at economic factors, we looked at factors from outside and what can the people within the system do to make it more stable.

***Participant***

I think constant and continuous upscale upscaling. That should be something that creates stability, because for a process that was done 70-80 years ago and you continue doing it the same way, while there's ways to cut the time and the cost, that creates... But your neighbor does it, it shakes your stability, so I think that can help. And also a more humane application of policy and regulations. Which derives to..., which is linked to what I said earlier about that tailor-made policy and less top-down, hierarchical sort of implementation/application of policy. So that comes from that.

***Interviewer***

So do you think this part is rather complete now? Do you feel like something is still missing?

***Participant***

I just remembered something. Maybe this goes to a financial viability. There's a lot of announcements about different financial schemes that can help farms and farmers with their production. You know, [what they do], but not all the information is out there and not everything is clear. So they can help, but to make an impact on the viability of a business, I think that they have to be a little bit more enforced in a better, comprehensive way. We don't all understand policy language or legal language in the same way. So I think that it is important to break that down to layman's terms, and when you convey this information to people who are supposed to use it, to be clear, thorough and comprehensible.

***Interviewer***

Comprehensible. So make it also understandable, the information. To make the information about those financial schemes more comprehensible for the ones who have to...

***Participant***

Yes, how to get there, how you can apply, who can apply, for how long, what is the amount. You, know these sorts of things that can actually help in practical terms, not just people sitting in a room discussing about how to make a farm more viable.

***Interviewer***

Yes, nice if you feel this is complete then I'll stop sharing my screen.

***Participant***

I think it is.

**Appendix B.5: Interview 5**

***Interviewer***

I worked together with Britt on developing scenarios for the future of the, mostly for the poultry sector and she has developed 6 scenarios in total and from those six scenarios, we're going to develop future business models for the sector. So, these business models do not exist yet, but they're constructed from the interviews with experts on how the future of the sector may look like. And within this project, I'm doing my master thesis and it's about sustainability assessment of the poultry [...] farming systems. My goal is to have a really broad view of farming systems, because Britt has taken an ecosystem perspective. And I would like to do the same. So not only the farm itself, but also the broader context in which it's embedded in and look at sustainability from that perspective, that's why I really like to have your expertise. OK, because I want to discuss these dimensions with you and mainly from your perspective, social sustainability, economic sustainability, institutional sustainability, and environmental sustainability, yeah, from your expertise and afterwards I hope to develop some sustainability goals in collaboration with you. So that's what I'm wanting to do today with you. And would you mind, so I have it on transcript and then recording, just specify your role in Code Refarm.

***Participant***

You need a clarification of what we are doing in Code Refarm?

***Interviewer***

Yeah, because I have it on the e-mail, but if I have it in this transcript as well, then it's for me nice.

***Participant***

If I may. Can we start with a very brief 2 minutes of presentation of [company name] just in order to explain who we are, and what we do. And [name] has some two of these slides of this and then I can explain our role in the projects.

***Interviewer***

Sure. Yeah, absolutely.

***Participant***

OK, so if I may I share shortly, the quick presentation I have. Or OK, please confirm me that you're seeing my screen.

***Interviewer***

Yeah.

***Participant***

OK, perfect. So. As [company name], we are a scientific research company based in Italy and we are in a form of a consortium company. We are made of 32 food industries and we also, as a consulting partner, the Italian Ministry of the Agri Food Research. So, we are a public private company here you can see our partners. So, the members of our consortium, so both private and public entities, I don't know if maybe you recognize some brands that are known worldwide. As for example Colussi, Cargill or Kerry. So that's why also our [...] from my mail we are mainly representing food industries. So only, uh, some key pillars of our company, we are non-profit companies. We have 41 years of experience, and we are focused on industrial, agrifood, research and innovation. And we are innovation driven and are focused on food technologies and also, we collect, map and analyze industrial needs and requirement in defining solution for the food companies. And well we have also a wider national and international network. Also doing it in the also food, everything food related and also in our Research Center. So, because we represent..., we have as part of our consortium both national but also international companies. Here, the European project we are part in, we are not only involved in European project but we also deal with national project. So, we are active in, in the research for the research and innovation based in food, and we mainly carries the vision of food companies inside the projects. We also have some tools, for example, this is a augmented reality-based app. So, for explaining and transmit easier information to the consumer with related to food

products. And here is our involvement in food [defense] in a safe delivery, so taking care about food delivery, against taking care about possible alteration [tampering] of food. So, we also have a specific product inside our portfolio. So that's a quick overview of what we are and what we do in general.

***Interviewer***

Yeah. Thank you so much.

***Participant***

So I don't know if some question your name is [name] OK? I don't know if you have some additional questions to [name], so that's otherwise I can say spend two words and our role in the project.

***Interviewer***

Yes, please. Yes, go ahead.

***Participant***

OK, OK. As you see in the presentation, we are, [you have] considered as a platform of industry. We are dealing with everything that is related to research, innovation, and certification of food inside the food sector, food industry sector. And, we are acting in a research project, so in the research project we bring the requirement needs of our stakeholders but also, we bring some our research activities. And so sometimes we also able to produce some prototypes and something that we have seen in the presentation, in particular in the Code Refarm project we are involved in the very first part of the project we were involved as we are dealing with end-users. And we are user to collect their requirement and ask them about their needs, their challenge. The very first part of the project and the very first part of the project, we are involved in the workpackage too and we collected needs requirements and challenge from these stakeholders. Of course, as [name] says and also you saw our network, unfortunately in our network we don't have an industry that are dealing with poultry and goat farmers and stuff like this. So uh, also in the projects we use the network that the other partners has in order to collect their requirements. And then we analyze the requirements and also we produce the deliverable. I don't know if you have the possibility to read the deliverable, but in the deliverable in the final part you can find two pages with the conclusions, and in which reported conclusion for needs requirement that we got from poultry sector and goat sector and for the consumer. And this was, I guess our main part in the in the beginning of the project. We give the kickoff. We were involved in the kickoff for the project. And then, uh, we have another rule in the second part of the project that's linked to the task 5.4 and we are developing starting from our previous prototype, we are developing more advanced prototypes of consumer app based on augmented technology in order to develop tools. We're working on this, a tools that will be designed in order to give specific information to the consumer in a different way. At the moment the food industry is used to



communicate to their customer with text. That's with the label. Yeah, using the label, using the packaging, and so using text. In the label you can find on the package, on the food product you can find several messages that are used... The food industry uses this these method to send messages to the consumer. But we would like to use more engagement and more I can say, young a wave of communication. Communicates with augmented reality and so with the application you, as the food industry, can communicate with video or images. Yeah, you understand. And so, we are working on this. And we have more advanced prototype of application with some problem, but we are trying to find a way to produce the most advanced prototype. With the idea to, in one or two three years, to arrive in the market. OK. Yeah.

***Interviewer***

OK. Yeah. So, what I hear is that you have quite a lot of expertise both on the end-user side as well as the food industry, food company side. So yeah, if we could, if you could answer the questions I have from that perspective, I think it would give me a lot of beneficial information.

***Participant***

Yeah, this is the goal of this [...]. But I would like to say that unfortunately again I repeat. We can bring to you a general view. [...] of the food industry food supply, but not specifically sorry, not specifically for the poultry and goat sector because unfortunately we don't have this kind of company inside our network. But if you can give you some [added value] we have to try to do to our best.

***Interviewer***

Yeah, absolutely. Absolutely. I think if I have a..., I really would like to have a consumer or end-user-based perspective on sustainability as well, but also food company perspective because it is a part of the of the ecosystem in which products are developed and produced so that will be so that will be amazing. Because what I try to do is, in the academic literature, there's not really a coherent or one idea about what sustainability should be. There are different elements to sustainability, and I choose for elements, social, economic, institutional and environmental. But if you hear the word sustainability in the context of the end-users you researched and the food companies, what would sustainability entail in a few, in one or two sentences?

***Participant***

Yeah, it's very difficult. Difficult. Yes, sustainability. I can say that from the food industry point of view sustainability is more or less 90% is correlated to consume less, less consuming, less consuming of energy of raw material and produce more. OK, so reduce weight. And also, of course it has to be connected to increase the profitability of the food company. This is the main concept so reduce the waste but produce more in a better way. Better means better way for the for the environmental, also

for the social dimension. And so and so. But the most important thing is that through sustainability you can create added value. And so increase the profitability of the of the company.

***Interviewer***

Ah, and if..., what would that look like? Because through sustainability you can have added value for the company. Do you have examples for that?

***Participant***

Yes, the main advantage for the company is the communication of sustainability to the consumer in order to utilize or to have new clients or to increase the [fidalization] of the old clients.

***Interviewer***

So improve..., you said improve the communication?

***Participant***

Fidalization. Uh, sorry, probably is not the right [word]: loyalty.

***Interviewer***

Loyalty. Ah, OK, yeah.

***Participant***

Sometimes I translate the word from Italian to English in Italian way.

***Interviewer***

Then I learned some extra things as well. OK, so improve the loyalty in terms of the customers, yeah.

***Participant***

Yeah. And also if you think about the energy consumption. In this way sustainability could be to reduce the energy consumption, and so to reduce the costs. And so this can create added value for the food company in terms of..., reduce the cost so you can have more profitability.

***Interviewer***

So reduce costs, so those two actually link?

***Participant***

Yes. Then we have another dimension that is dimension that's related to the regulation requirements. And also the standards requirements. Because sometimes if you want to have access to specific

market or specific nations or also if you want to stay on the markets you have to be sustainable in sense in yeah, that's you have to do something and so this can be another driver. Yeah. So, the regulation requirements are important for the food company because they have to be compliant with them, but also some standards that are not mandatory. And these standards. Are important for the food company to enter some markets. For example, for the other sector, they require a lot of standards.

***Interviewer***

So you said the standards you're talking about now are not from the government, but they're from the food company side or?

***Participant***

Yeah, we have two drivers. One is the regulation. OK, that's point. And the other driver is something that is not mandatory, [its] voluntary. Yeah. And so, it's voluntary, but sometimes. If you want to enter in some specific market channel. You have to be compliant with some standards that are also related to the sustainability.

***Interviewer***

And so they come from within the market, those regulations?

***Participant***

Yeah, yeah. Some specific [certification] something..., you need it in order to be compliant with some, what am I gonna say, market requirements.

***Interviewer***

Market requirement, yeah.

***Participant***

And this is also important for the consumer. Because if you wanted to have some type of consumer, you have to be compliant with some standards that are not mandatory but that are important for the consumers point of view.

***Interviewer***

And in what way are they important for the consumers?

***Participant***

There are some certifications. Uh, some [stuffs] are important. Like, I don't know, for example, water

footprint or other type of the sustainable standards. Some consumers want this kind of certifications and standard. And also, for..., not only for the environmental point of view, but also for the social point of view. Social dimension, those standards are related. I don't remember the name, but you just told me to give an example. Standards, social standards in which the food industry say that this product is made in a certain way. Not using for example child[-labor]? Something like this. Or sometimes the food is communicated that I don't know for the gender perspective, for example, we are compliant with this, this, this, this. Something like this. Sorry, in this moment I don't have some very specific examples, but I know that this kind of standards that are important for the markets and also for the consumer.

***Interviewer***

Great. Uh, yeah, so, those standards are developed from within the market in terms of what consumers actually want or require?

***Participant***

And if I may, I would like to say that's this is related only to my experience. So I say personally, I don't have so many data to support this, this idea that I have in mind. But what I can hear from the company that's really important to find new ways to communicate the circularity, the sustainability this kind of concept for the food industry. Because sometimes, many times they [are forced] to be compliant with some regulation standards because they, for some reason, they need to do; they need to do in order to have access to some, I don't know, to some retailers, some market channels. But this message arrives in unclear way to the consumers. And they would like to, this is the way we are trying to develop the application, the web application, the food industry needs to find a better way to communicate these messages to the consumers. OK, sometimes you can, I don't know, you see, on the on the package, certain certification, blah, blah is all blah blah. But if you are not a technician you cannot understand what does it mean. Behind this certification is a lot of work, a lot of things, and also cost. That the food company, yeah, do it. You know, order to obtain this certification. And so it's important for them to commit to, to find a way to communicate everything that they are going to do in order to achieve this, this certification.

***Interviewer***

Yeah. So it needs to..., from the food companies perspective, it needs to become more understandable for the consumers what the labels trying to communicate? yeah.

***Participant***

Yes, exactly.

***Interviewer***

Yeah, because let's see, because we have a lot of information in different sustainability criteria. But if you both look at for example, social sustainability how would you describe from the food companies' perspective good social sustainability?

***Participant***

[Difficult question]. I have to say I am not an expert in this field, but this is also based on my experience and my feeling of the situation, at the moment for the experience that I have, it's not based on data, on science. I have to say that the social dimension, in this moment is the less important dimension for the food company. And if they are doing something, it's something that's required only from...

[loud background noises - inaudible]

***Interviewer***

Because a lot of things are happening outside right now.

***Participant***

No worries. OK. Again, it's something that's it's required by again by regulation or by markets requirements.

***Interviewer***

Yeah. Sorry. So it was most from..., if something happens [regarding social sustainability] that is mostly from the market requirements or from regulations.

***Participant***

Yeah, in my opinion, yes, but this is again not based on large questionnaire, large survey. It's only based on my feeling of the situation.

***Interviewer***

Yeah. No, that's perfectly fine, because that's also a really valid response because nothing's happening in a vacuum within innovation in my perspective, so yeah, absolutely. And [name] maybe?

***Participant***

No. Yeah, I was thinking, the same because. At least what I think about social sustainability, but yeah, I was thinking about palm oil case, that happens worldwide. And this is an example that, yeah, is [...] border social and environmental. So I was only thinking on how to place correctly it. And yeah, it

could also be an example of social sustainability, but mainly the only case, or at least the only real case that arrived mainly from consumer request or any way consumers behavior that intrinsically ask the food companies to change products and recipes and so on. But yeah, I think that that's the only example that happens to me. That comes here in my mind. Another factor could be only mainly I don't know. I'm thinking for example, cocoa or chocolate farming, who works in foreign countries. So where we have cocoa plants and so on. So Latin America or Africa, they may be applied some kind of social sustainability [sponsoring] this so that they are helping local people in providing them some help in work or better life. But yeah, it's always mainly driven by marketing or try to communicate or legislation. Anyway, you cannot go there and only exploit people for forcing to work. So these are these are only the two example of social sustainability that has come to my mind.

***Participant***

Yeah, but I think it's reasonable if you..., if I can give a rational behind this idea: the social dimension is less important for the food company because the social dimension is less important for the consumer at the moment, and I say from the European or Italian consumer If you think. I'm not scared about the possibility that's, I don't know, my biscuits that I have on the table during my breakfast is produce in using, I don't know, worker that are less of 16 years old. Stuff like this? No, just to give an example because we are living in at the moment. We are living in an environmentally dimension in which it's not..., it's forbidden in the law. There are requirements that say that is not possible to employ people under 16 years old. I know that this is a stupid example, but just so you to clarify and to give a reason why. But on the other hand, I'm scared about the possibility that this is produced burning a lot of oil. Yeah. And just like this. And so, I if I can add another point that I forget another things that's important for both for the consumer and then for the food industry at the moment is. Reduce the length of the supply chain. That's another driver for the sustainability that's really important for both side: consumers and the food industry. And you know the, I don't know, in English 0-kilometer supply chain do you have something like this? Yeah.

***Participant***

Short of supply chains, yeah.

***Participant***

Yeah, but so, it's really important, uh. So, reducing the supply chain for the environmental point of view in order to reduce transportation. But this is also related in some way to the food security. And this is a related to some to something that is [explored] by the war. The Ukrainian war, yeah. Uh, this is a concept that is not on the top of the [cream] now, but it's on the bottom, but it's something that the people are starting to think. And also of course for the food industry is more important because if you can reduce the supply chain and if you can increase the security of your supply chain, this is a large

impact on your business. And also in your present business, but also in the future business. You [...] all to be related to the social dimension. Because if you reduce the chain, you can also have more control in some social issues. That's, if [...] internal in Europe, for example, you can have more control.

***Interviewer***

Yeah. So that also a bit about what you told us because we have certain labor requirements that people under 16 cannot work. And if the supply chain is short then the food will be produced under those same type of regulations for example.

***Participant***

The example of the work is a stupid example, but just to clarify.

***Interviewer***

It didn't. Yeah, it's [the example] understandable for me. So that's great. No, but I understand what you mean. Yeah. OK. And so, you discussed a little bit the environmental sustainability and we now have a reduced energy consumption and have a short supply chain. Do you think there are other elements of environmental sustainability that are really important for the food companies?

***Participant***

Yeah. Yeah. So reducing the waste, of course. I know that's a lot of company are involved in a program like donation of foods. I know, and I don't wanna say waste food because it's not waste. Yes, the surplus food something that is going to become waste, but it still is not still waste so they can donate this product. Before that they expire and everything that is related to reduction of waste is important for the food company. Because if you reduce the waste that you produce, that means that you have less cost. And the second is also a message that is very important to communicate to the clients, the customer because if you are involved in this kind of programs. This is something that you wanted to say to the consumers, because it's something that's good for the image of the of the company.

***Interviewer***

Great. And [name], do you have any ideas?

***Participant***

No, no particular addition about environmental sustainability. No, I think this is the main focus point.

***Interviewer***

Great. Then we have some elements that economic sustainability and which is from the food companies perspective is to reduce cost and increase the loyalty to a certain company or brand. Are there other elements you feel are missing here or should be added?

***Participant***

[...] say you may note because sometimes when I speak, I try to put some notes that's something that I have in mind: everything that's related to environmental fingerprint is another concept that probably it could be important for the food company to communicate to the consumer. So reducing of water consumption, raw material consumption, CO2 emission. And the personally [company name] we are working to a new sustainable standard that is related to the reducing the emission, the involuntary emission of microplastics in the environment. This is the something that research that is a new standard, that's relative to the research dimension we are tries to figure out some guidelines for the food companies to give them the possibility to produce in a better way, in order to reduce the emission of microplastics in the environment. This is, yeah, something that we are working with.

***Interviewer***

So that's relatively new.

***Participant***

Yeah, this is the totally new that we are doing in the European project. We are working with the Italian national [standardization body]. And we, working groups with some experts from different fields and we are working in order to set up these guidelines. Voluntary guidelines.

***Interviewer***

OK. Yeah. They're so they're not from the government, for example, they're from within the industry.

***Participant***

In this, yeah, with this work, we are anticipate to the the requirement for the regulation.

***Interviewer***

Yeah. Yeah. So you're step ahead, actually.

***Participant***

Sorry, uh, I'm not sure to put it because, I saw you wrote a post it about it, but actually [name], please correct me if I'm wrong, but it's not something that companies are really care, it is mainly consumers concerns. So that's why we are trying to cross match the things so. We would like to increase the food companies' sensibility into this voluntary regulation, but up to now they are not pretty much taking



care about it, because also maybe they are, they don't know because there is an unintentional release [of microplastics]. So we are trying to increase this sensitivity.

***Participant***

If I guess, if I may give you, uh. And yeah, we can, uh, replace uh and not speaking about microplastics but innovative sustainable standard.

***Interviewer***

Innovative sustainability standards.

***Participant***

Yeah, innovative, environmental sustainability standard. And these include, of course the work that we are doing with microplastics. But since it's very innovative, of course, neither the food company nor the consumers at the moment are aware about the standard, it's about these issues because it's, uh, a very new.

***Interviewer***

OK. Yeah. So that's the part of you anticipating that it will become important in the future as well. Well then the final dimension for me would be the institutional sustainability and you've mentioned already that there are two types of yeah, types of regulation within the sector and that's from the government perspective, but also from the market itself. Are there other types of elements or like organizations that try to influence the sustainability in this sector.

***Participant***

I would like to see something related to the resilience. The resilience of the food industries of food chain is something that I have in mind. It is not a clear concept, so I'm trying to. [...] So I think that's it's really important for the sustainability of the system, the social system that we have in Europe. And it's very important the role of the food industry. And the resilience of the food industry to the [withstand a] shock. If you can imagine what's happened during the pandemic and the lockdown and everything works well when we were in lockdown because you can find foods, on the retailers on the market. This was a huge effort. From the food industry because they have, they work in a very difficult situation. But, the food industry has shown it was really important and this is I think that will be crucial priority for the next year. Uh, because you say that we are developing scenario if I were understand. And we are doing more or less the same, we did this exercise before the 2019. So before the COVID we imagine some scenarios. That's after the COVID are totally different. And we are trying to do the same, of course, order to work, we need in order to work on these activities, we need some projects, research projects because we need the budget and so now we are trying to do this in

another national project in which we will receive some money and we are imagining some different, now totally different scenarios. We are talking about scenario in which we will have probably food shortage that are linked to the problem of the war again that's created. We create the issues that's related to the fertilizer shortage. And so this is..., we create [a scenario of food shortage?]. So the resilience of the food industry of the food sector against external shocks that can be financial shocks that will be, yeah, something that's can be related to the food shortage shock. Something like this. Also we are working in the scenario of bioterrorism that can create shocks. Something like this. Of course, we'll have a lot of implication on the social and the social and economical dimension. And also environmental dimension. Because before the war in Crimea we were scared of the palm oil. But when the Crimea war started, we say, OK, we probably we don't have sunflower oil but we need this kind of raw material so we can use palm oil so the things shift. OK. And yeah, and this is something that can have implication to environmental dimension, to social dimensions. And so if you think this we are burning coal in order to have some energy and we did it during the winter in order to [...] winter. So you can imagine how important is the resilience and the external crisis that can have an impact on the full sector and the resilience of the food industry towards this external crisis, or shocks.

***Interviewer***

Shocks. Yeah. Yeah, that actually relates to the second part of what I wanted to ask you because you already discussed the resilience of the whole system in terms of the sustainability. And I was thinking, do you have some like, best practices or ideas how we can make the food system more resilient because you said you have some scenarios lying already. Do you have some ideas on how we can strengthen the resilience of the system?

***Participant***

Yes, very confused idea, because this is a very difficult topic. Yeah, that sometimes... Yes, you know in the first part of our discussion, I always say that the driver for the food industry is the consumer perception. OK. But if we think about resilience, it's something that's it's out of the mindset of the consumer. But not in this case..., the drivers have to be, or will be there the authority, the national or the European Authority. And so some ideas... Some ideas is that of course we need to..., of course, first of all, to reduce the supply chain and to increase..., the authorities have to start to think how to increase the food security. National food security: that's a concept that for many, many years, a concept that has not been linked to the Western countries. We develop, the WHO develop the concept of social [food?] securities for the third countries, for the African countries, for the Asian countries. But at the moment we are to think about the possibility that we in the future we have to pay something that can be related to the food security. And so we need from the institution, from the government action that had to be put in place for preventive for study, for understanding and for preventing this kind of issues. And this is something that, as I said before, is not a consumer driver. Authority driver;

something that's coming from the government. But OK, I don't have the magic stick and say you have to this, and this, and this. This something that is out of my experience.

***Interviewer***

That's no problem. It's a really nice example of the authority that should be a driver in this case. Yeah. And if we look at the second part, because these are all parts of the food system as a whole, is the viability so that everybody in the system can earn their money, for example. And do you have some goals in terms of the food companies, how they can stay relevant in the society we live in now?

***Participant***

You mean, but when you say viability or what do you mean exactly? Because it's something that I don't understand.

***Interviewer***

Yeah it has a more of an idea that the company can financially sustain itself or the system can financially sustain itself.

***Participant***

So staying alive? Came to this concept.

***Interviewer***

Which what concept?

***Participant***

You mean viability as a staying alive. Being oke to survive to whatever happens, OK.No, no. I only wanted to clarify for thinking.

***Participant***

Yeah, something that's I think that's again, I started the discussion without having a clear reminder what's is my final goal. But [...] to frame myself to think. And so something that is very important, we talking about food security, we're talking about authority [...] But another concept that's in my mind is very important is that we have to start to think to the food sector, to the food chain have a critical infrastructure for our society. In the US they already include foods in the list of the critical infrastructure. When you talk about critical infrastructure [...], that's OK. It's critical for the nation. For example, transportation, also energy is a energy [...] is a critical infrastructure, because without energy without infrastructure for the energy it will be a huge project for all of us. And also all that is related to the transportation it's critical and in Europe, the food chain is not yet considered as an

critical infrastructure for many reasons. But I think that regarding the ability, I have to think that until now all the companies are in the markets and they can receive some money from governments, some subsidies, something like this. But if you are a food company, that is not able to stay in the market, you can fail. In some way, I guess that we have to identify some sector that's very important for our [...] and I mean in the food sector, some industry that, let me say this, they cannot fail. Because they are important, this can be a matter of viability. So we cannot imagine a future in which all the food companies will be owned by Chinese farms, something like this, no? We have to start to think about to protect the food sector in some way. And to consider the food in the food supply chain like a critical infrastructure at the European level.

***Interviewer***

Thank you so much. And I see we're nearly out of time. So I really want to ask about the final final part.

***Participant***

I would like to say that again, these are something that is inside my crazy brain, so please do not consider this like a real proof. This is something that I have in my mind as I like to discuss with you and with other people, but sometimes it can be stupid things, so don't base your work only on my idea because I'm not sure.

***Interviewer***

No, don't worry.

***Participant***

I know sure, there's other people think than me, so probably you can receive some critics on this concept.

***Interviewer***

Yeah, but that's actually the goal, because sustainability... There's never has been any or there's really.... Sustainability is really contested concept in that sense, so nobody's in agreement with each other, at least in the academic literature. And I also see it in the sector. So having those diversity on opinions is for me really crucial, because then I can see: where do people agree and where do people disagree and how should we reframe this concept for this sector and for the food system as a whole? So it's really good if I have divergent opinions on this. But if you have one or two more minutes, then I would love to hear if you have ideas on how we can make the system safe, not from external shocks, but how can we make the system as a whole stronger?

***Participant***

Mm-hmm. Yeah, stronger. Umm yeah, I can see something. That's I wouldn't... I don't want to say that.... Because we are in period here with a lot of inflation. So I think that they are. The main issues that the food industry are facing, they faced is the cost of the product. We are we are living, we are used to live in the society in which the consumer don't pay so much for the food. OK, I remember that's my boss had a banner yes something that you take from a publication. And he put on of the internal door of the office in which there is a table. And there was a table, a confrontation, 2 columns in one column there was the cost or the unit, for example, petrol, energy, electricity in the 1950 and food. And on the other hand, the cost, the same cost in the 2000 and something doesn't remember exactly. And if you can see everything increased and the food, the cost of the food decreased a lot. That means that we are used to pay not the real value for the foods. I think that in the future in order to make the system more stable is to reduce the competition the price competitions. It's something that it will be very difficult. It will be very difficult, but we have as consumers, we have to be training in pay more for the food. Or to consume less. If they want more, they pay more. If I can say something like this, for example, on a TV show in this moment I think that someone [will shoot] me with a with a gun because in this moment all the products [costs] are increased. The cost of the product increased. It's something that is not popular, it's a concept that is not popular. But I mean I think that's we are to think that the food is a very important product. We have to say to the industry, we have to spend more, OK, spend more for food, less for t-shirt or for shoes. If you can understand my stupid example, no. Yeah, this is what I have in mind.

***Interviewer***

Yeah, amazing. [name], do you have something to add?

***Participant***

No, actually stability is really too much difficult. No, I think that [name]'s idea it's OK. Yeah.

***Interviewer***

Great. Amazing. Well, this looks really good. And yeah, also, I'll stop sharing my screen because I think this is rather complete now.

## **Appendix B.6: Interview 6**

### ***Interviewer***

So that's great that you that you could make the time. Do you see my screen? So I made a small template and I want to ask you if we can fill it in together today and based on that I'm going to combine it with other interviews and make a kind of model of what we're going to work towards in terms of sustainability. The first would you explain a little bit about your role in Code Refarm? Could you tell a little bit?

### ***Participant***

So I actually work for one of the lab partners. We're developing and microbiota test for goatmilk to look at the different bacteria that are that are in the milk and through the project. Try and understand how these bacteria are linked to animal welfare or product quality or other properties of the milk that we've been testing. And so, yeah, and I've also sort of been this spokesperson for the Swiss farm. That's one of the pilot sites and it's... Yeah, he doesn't really speak English, so I've kind of been the go between person for that. But yeah, I'm afraid any of my answers regarding agriculture are gonna be rather biased by my background from New Zealand growing up in a farming background there. So I'm not sure how much that might [...] either, because I know considerably more about the agricultural sector in New Zealand than in Switzerland so.

### ***Interviewer***

Because you grew up on a farm? What kind of agriculture was it?

### ***Participant***

Mostly sheep and beef.

### ***Interviewer***

I'll take that into account. And you also said that you were the spokesperson for one of the farmers in Code Refarm, right?

### ***Participant***

Umm yeah, the translator though. Go between person. Kinda.

### ***Interviewer***

So if you take some of some of that information into this interview, that would also be OK. I wanted to first start with this this framework of sustainability. There are multiple frameworks of [sustainability] but from what I have gathered from my research is that this framework is appropriate

to use in the agriculture sector. So that's why I chose this. And if we talk about sustainability within Code Refarm, if we started a middle here, what do you think is the most important element of sustainability in this?

***Participant***

How do you define sustainability?

***Interviewer***

Yeah, that's based on your experiences.

***Participant***

And do you mean like the sustainability of the project or the sustainability of the farms within the projects or?

***Interviewer***

I have taken a rather broad view of the farming systems, so actually the project is from Farm to Fork. If you can view it from a Farm to Fork perspective in terms of sustainability.

***Participant***

Sorry, I'm just not really sure like what kind of answer you're looking for? Like what you are saying? What is the most important, [...]?

***Interviewer***

Do you have an idea of what could be? If there is no answer, that's also an answer for me. But if you look at these four pillars and you have something here in the middle, do you think there is... you have maybe a sentence or an idea on how this framework of sustainability fits within the Farm to Fork system, studied in Code Refarm.

***Participant***

Can I just ask a question? What do you mean by an institutional sustainability?

***Interviewer***

It's more the political and institutional context in which the farming system takes place. For example, some stakeholders say European Union, local government, maybe other players.

***Participant***

OK, so I think with Code Refarm the key factors that they really focusing on are is animal welfare and

the different farming methods that intensive and extensive farming methods, which is linked to both to environmental sustainability and animal welfare. We're looking a little bit at the final product and the, I suppose, the chain to get there. But it's not a key focus of the test and the project they're looking at how different factors and how the animals are farmed, relate to their welfare and how that also relates to the raw product properties of the raw product and properties of the transformed product. I suppose we're talking about Farm to Fork. But or maybe it's just that I'm more involved in the analysis of the first part of the chain. I feel like it's much more focused on the production of the raw product rather than the transformation of that and how it gets from the production to the consumer to the final consumer. So, I think if that makes sense. I think it's more focused on the sustainability of the exploitations of the farms themselves.

***Interviewer***

Would you say then the production methods, or is that too narrow?

***Participant***

Yeah, production methods and practices like: what the animals being fed, how they're being housed, the time they spend outside. Factors like that.

[technical difficulties]

***Interviewer***

So I've lost the three [criteria] but I have them in transcript. So, we'll go to the other four elements and then at the end I will look it up. If you look at what you're working on and review that in the context of social sustainability, you can take that as broad or as narrow as you would like, maybe from an animal perspective or from a human perspective that's all fine. What do you think would be the main considerations to understand here or to be aware of?

***Participant***

Umm I feel like we're talking about social sustainability it more comes down to the steps further down the line. Like it's not so much what happens on the farm but what happens once the product leaves the farm?

***Interviewer***

That's one part of social sustainability of course. If you look at it from a broad context, maybe to spark inspiration a bit, others have identified social sustainability as animal welfare or animal health. Maybe in terms of easy production processes which do not require a lot of time or effort, for example by farmers. And if, you could, if you could look at it in this context, do you have an idea of social sustainability?



***Participant***

One thing that comes to mind is that, I really see on this this farm in Switzerland, is how everything is very locally sourced and a lot of it's done in house. Like they have cows on the farm which they use to produce yogurt which is fed to the kids in the milk is directly transformed on the farm into cheese which is sold in the local market and some directly from the [farms] where this very local ecosystem. Another thing that comes to mind is educating future farmers, and a big thing in Switzerland is their apprenticeship system and this farmer every year has new apprentices that are coming through and learning about this type of farming. And yeah something [the farmers] is very involved in.

***Interviewer***

And about those apprenticeships, who organizes that? Is that the farmer itself, or does anybody else do that?

***Participant***

No, so it's a federally organized system and so they... Yeah, it's a very structured system where they have a certain number of days of class. They have blocked courses and then they spend, over three or four years, they spend a year each on three or four different farms to learn farming systems and they come out with that with a recognized paper.

***Interviewer***

Is there anything else you would place near social sustainability?

***Participant***

But I think the general public are not necessarily the best judges of that, but they like to think they are.

***Interviewer***

You say the public isn't really aware of animal welfare or?

***Participant***

I feel like they think they are, but they don't necessarily. Yeah, they'll see one thing and make a judgment about a whole farming system or a whole farm based on this one small thing.

***Interviewer***

And how would you [define] animal welfare in this context, do you have some ideas from what you're doing right now? Because you're studying the microbiome, or the bacteria.

***Participant***

How that links to animal welfare, or? That's what we're trying to understand. I mean, there are some, there are some bacteria that are clearly pathogenic that have a known link to mastitis or that kind of thing. Umm, but more than that... Yeah, it's not something that's been studied a lot. And that's what we're trying to do in this context, yeah.

***Interviewer***

So you're still studying?

***Participant***

Yeah, a lot to be studied there, yeah. Yeah, I don't know, I suppose.

***Interviewer***

OK, let's see. Then we can go to economic sustainability. Do you have any ideas on how does farming system can be as economic sustainable? I think I heard you talk about the quality of milk, for example.

***Participant***

So, sorry, what's the question?

***Interviewer***

What are important considerations in economic sustainability?

***Participant***

Quite honestly, I don't feel like any farm in Europe economically sustainable with all this [...]. What are they called in English? I come from a country with is... subvention the right word? Subsidies. Subsidies. I come from a country where there's no subsidies, so to come here, where, especially in Switzerland, farming is chronically not economical whatsoever. So I have a lot of trouble understanding and I feel... I mean, I'm. Yeah, I feel like the only, yeah.... The farm size relates to economic sustainability a lot.

***Interviewer***

That's interesting because if we go back to the to the subsidies. You feel like..., I need to be careful that I phrase correctly what you said, but, that by having subsidies for farmers means the farms are not economically sustainable?

***Participant***

If they can't survive without the subsidies, I don't know. The way I understand sustainable that it's

something that can sustain. And so if you can't survive without subsidies, I have trouble with this. Yeah, but then at the same time, I do appreciate the importance of keeping these farmers and keeping. This small farm ecosystem and keeping these exploitations going.

So it's yeah, but it's... I suppose this is also one of the key arguments for intensive farming systems is that they are more economically sustainable because you've got more animals, more output. But yeah, that's something that's code Refarm is trying to understand, is how having an extensive farming system affects the welfare of the animals and the final product quality, because that also then affects how much you are earning on what's being produced.

***Interviewer***

So it's a multi-dimensional aspect actually?

***Participant***

Definitely. And I suppose the project is trying to understand how some of these factors are linked, because they're all factors that do have an impact on the economic sustainability.

***Interviewer***

The third element of sustainability is institutional sustainability. We've just discussed a little bit about what it is, the institutional and political context in which the farming system takes place. Who do you feel are very important players right now? Yeah, maybe let's start there.

***Participant***

I suppose that comes back to subsidies again. For all the farmers that yeah...

***Interviewer***

Shall I call it government, or just subsidies?

***Participant***

I you want to. I don't know. I suppose the people who are responsible for giving them, for all the farmers that depend on them. And then I suppose there's the bodies who govern the rules for a certain farming system and minimum product quality and testing. Heard testing, milk testing.

***Interviewer***

So these bodies, you say they make rules that farmer should adhere to. Is that also govern..

***Participant***

And for monitoring.

***Interviewer***

And monitoring.

***Participant***

I think it's different levels. It depends on the country. It depends on, yeah. In some cases..., If I think to New Zealand is gonna be the cooperative who does all the milk collection and transformations. So the [...] supplying your product to them, so they define certain criteria that it has to meet. And there's also a whole governmental level. But there's sort of two different things. I think it really depends on the country. There is a certain amount that's governmental. There's a certain amount that's it's, I don't know. In Switzerland they have a goat farming association that governs certain things. Then there's the people who are receiving the [raw] product and OK. So I feel like there are different layers.

***Interviewer***

So at different parts of the of the farming system, there are different decision-makers, or governing bodies.

***Participant***

People putting requirements or yeah, yeah.

***Interviewer***

Do what do you what do you think what kind of effect that has on the farmer, or the system as a whole? Do you think this is [doing] well or do you think it could be improved somewhere?

***Participant***

Again, I'm sorry my knowledge and this comes from New Zealand, not Europe. But I feel like there's a massive gap between the governmental policy makers and the impacts that that has on the farmers. If we take, I think it's the same in the Netherlands at the moment with the carbon dioxide measures. It's been a massive issue there, right? They're talking about having to shut thousands of farms because of the emissions, aren't they? In New Zealand. That's been a really massive issue lately as well, because they're going to start taxing despite New Zealand having the lowest carbon emissions per litre of milk produced in the world, I think Ireland is the 2nd and they're massively higher than New Zealand. They're still gonna start taxing farmers unreasonable amounts for their emissions. We have farmland that's being planted into pine trees to... Yeah, I feel like there's a similar to in the Netherlands. This massive disconnect between the reality of the impact that this is gonna have on the farmers when it's a country that their biggest industry is agriculture.

***Interviewer***

And just from personal interest, did you say New Zealand has very little carbon dioxide emissions per liter? Is that also based on the extensive versus intensive farming system or?

***Participant***

Everything in New Zealand's extensive when it comes to milk, there is no intensive farming.

***Interviewer***

Oh, really? OK, I did not know that.

***Participant***

I mean, in winter it's warm enough for the animals to be outside. Still and yeah, there is intensive farming of other animals like pigs and chickens, but cows, everything is extensive. So it's just that... I suppose when you live in a country where there's more space, it's a little bit easier to do that.

***Interviewer***

Yeah, because, what you also said, here it is often framed as also what Code reform is trying to disconnect the ideas, but that intensive [farming] may be more sustainable and more efficient.

***Participant***

I suppose they're trying to get more, more data about how that does impact environmentally, how it impacts on the animals, how it impacts on the product quality and cause. Yeah, I think people are quick to get up in arms about how it's bad, but yet they still want to buy the cheap products. So it's... Giving more data for such a multifaceted issue, yes.

***Interviewer***

Yeah, absolutely. Yeah, that's really that's really difficult. Well, maybe that's also a nice link to this part because that's about environmental sustainability and it's also about emissions. For example, I've also heard it conceptualized as the use of antibiotic, landscape.

***Participant***

I spent a week at an agricultural exhibition and couple of weeks ago and we were talking all about fertilizer use. I think that's a... Soil health but. I'm sorry it also links into, yeah, environmental sustainability that is also... You're intensive, extensive [data and it] becomes into that as well. But then I think this thing's further down the line as well, like where your feed is coming from. And where the product is being transformed, where it's being exported to. There's a whole lot off-farm factors in that as well. And then there's the emissions as well, of course. Which is a quite a controversial topic at

the moment.

***Interviewer***

It is, but it's good to talk about.

***Participant***

And I suppose trying to find the right balance between not going: OK, everything's fine. You know where the like..., if you take the example of New Zealand, at least they're not just going: you know, we're already the lowest, let's just leave it there. But finding a reasonable balance, not being so extreme that it's gonna have negative effects that haven't been thought through. Not only on the farming ecosystem, but all of the businesses that supply that in the....

***Interviewer***

You say there are so, there needs to be a balance between, between the goals you want to achieve and between [...].

***Participant***

I suppose, between trying to take positive actions for not just for emissions but for soil health, for soil health, for animal health. But also yeah, that needs to be balanced with the potential decreases in productivity or economic sustainability. You need to find a balance, a balance that is sustainable when itself. Not just for the farm, but for, I mean we have entire economies that depend on that and it's not just the farmers and in the consumers, but it's the..., I mean I was. Yeah, this agricultural exhibition is the largest in the southern hemisphere. So you've got all of the companies that specifically provide products and services for the farming industry. So if you start decimating the farming industry, you're also removing all these other players that, I suppose it's taking this, which is what your diagram showing you is taking this bigger picture of how all of these types of sustainability linked together and the impact of making a drastic change one can have on the others.

***Interviewer***

Yeah, that's indeed the picture I'm trying to get here. But then specifically for Code reform.

***Participant***

Sorry, I keep diverging from Code reform.

***Interviewer***

That's OK. Let's see, because my next step would actually be... If you look at what, you actually have discussed it quite extensively, but what do you think would be the main tradeoffs or synergies

between the elements we have got here?

***Participant***

I feel like improving environmental and social sustainability can often have a negative effect on the economic sustainability. So particularly between those trying to find a balance that. Yeah, you're improving this social environmental, but without being completely detrimental to the economic sustainability.

***Interviewer***

And then would you then see economic sustainability mostly in terms of the farmer?

***Participant***

In terms of the farmer. Yeah, that comment was in terms of the farmer, yeah, if we think of the bigger picture. Well, that becomes a much more complicated problem than I [know] a little about, but yeah. If you start looking at, I mean, social sustainability also comes back to who's getting what cut of the final price that's paid for the product. I don't know why we were talking about this yesterday and at a BBQ, but apparently Switzerland on dairy products the two big supermarket chains are getting between 60 and 70% of the margin, which is completely.... Which... In a system that's already not sustainable, you're only making the problem worse. So yeah, if you start [...] to some degree, social and institutional. Also, we need to start looking at things like why... People's expectations to buy certain things at certain price, like do we need to hear how much of this social sustainability is people realizing where things come from, how much they cost and...

***Interviewer***

So that's consumer-based? [...]

***Participant***

Consumer, I suppose, awareness maybe of the... But then that is difficult. Also, when you're in the middle of a cost-of-living crisis when people have no yeah, that's something that's also a luxury, for people who have the time and the money to think about this kind of things. So I don't know, if you if you start looking at the farm to fork in terms of sustainability. I think there are, yeah, so many...

***Interviewer***

I'm going to add this because this is really high on everybody's mind right now. And you know in in my view or at least sustainability goals and ideas about sustainability change, you know, they keep changing because every time we have achieved a certain goal, maybe something else goes wrong. So I think this is a really nice one to also add here because it's really part of the contemporary idea behind sustainability. So thank you.

***Participant***

And to go to institutional sustainability, I think it... To be sustainable, they really have to be in touch with all of these other, within the environmental sustainability with the social sustainability, with the economy, to be really in touch with the actors in those fields to understand the impact, that their policies, that the decisions they're making, are gonna have, I feel like that's often lacking. Because they clearly have a massive impact on everything else.

***Interviewer***

Absolutely, yeah. Do you have anything to add? Otherwise, we go to the next part.

***Participant***

No, but hope that's of some help. Sorry [...] I didn't go off in too many tangents.

***Interviewer***

No I really appreciate it because it gives me a lot to work with. Here we have actually painted a picture of what's happening right now in this system and then mainly from your perspective, what you've seen, maybe also a little bit about New Zealand perspective, but mostly farm to fork. And the second part is actually trying to see, if it's possible, if you can come up with some goals to make the system as a whole a little bit more robust, and able to deal with certain changes, certain pressures on the farming system. I've three parts, maybe we can start with resilience. How I've conceptualized resilience is mainly based on the farming system and [how] it can handle external shocks. You have some expertise either from what you've seen at the farm or what you've seen at your work.

***Participant***

Yeah, I'm really not sure I'm the best person to answer those kind of questions. What kind of external shocks are you thinking of?

***Interviewer***

For example, you have currently, with the climate crisis you have maybe changing changing weather patterns which would make certain crops or certain animals more, how do you call it, that they are impacted. For example, there were also some ideas of wars happening which resulted in less availability of feed, for example.

***Participant***

I really don't feel like very... Have any expertise to respond to that kind of? Because, [I was] thinking of this for this farmer and his very local, ecosystem, they produce a lot of their own food, they make their own mixes, but that does make you more vulnerable to extreme weather in in that region if all of



your feed comes from there. I'm sorry, I really don't feel like I am in any position to...

***Interviewer***

No problem. Let me know whether you feel comfortable addressing the other two, [or maybe they are easier]. But the second one is viability and I believe you already discussed it briefly, but with the subsidies. But it's whether the farming system is able to financially sustain itself.

***Participant***

Well, in Switzerland I think the simple answer is no. So you want improve... But you're asking for....

***Interviewer***

Do you have some ideas [...]?

***Participant***

It's hard because I mean here from a Swiss perspective, I suppose they've placed other priorities above the viability of farming. They want to preserve their image as a as a farming nation with cows, with cheese, with the traditional way of making the cheese. They have like a lot of special rules about how milk has to really produce to be allowed to be used for Gruyere cheese. They also want, apparently, and they want – in case of war – that there are many people who are able to produce food and that they can have it become a self-sufficient as possible if need be so, and they want to keep this small far concept, I suppose. Not to have these mega, this farm that's a pilot farmer, is the biggest farm I've ever visited in Switzerland. And most of them are, you know, 20 cows so and so it's. I think I feel like in in Switzerland, which is also quite different to the rest of Europe, but I feel like they've just accepted that it's not viable, but that other things are more important than viability and. And that, I mean, it's completely necessary. I mean, you can't, it's still necessary need to..., they need to keep it going.

***Interviewer***

So, partly you say there are these regulations which place a lot of [implications]. Or regulations for the quality or the type of milk used for Gruyere, that comes from the government, I think?

***Participant***

No, that would be that would be the Gruyere body. I would say it's their product. They would make the rules about who can supply them. I could be mistaken, but I would think it would be at that level.

***Interviewer***

And on the other hand, if I think back to what you said about the supermarkets getting 60 to 70% of the margin of the products.

***Participant***

But this is something that could definitely be in terms of viability. I think there's other actors further down the line that you could look into. Sorry, I keep on focusing on the on-farm aspects I suppose, without thinking about the rest of the downstream. That would definitely be one point. And then in terms of on farm, potentially, for improving both resilience and viability would be learning to... improving the sharing of resources and know-how and machinery between independent farmers.

***Interviewer***

So, you can share the knowledge that you have and maybe the resources. And I can imagine maybe if you're an independent farmer, at least in the Netherlands it is like that, as an independent farmer, you have very little bargaining power with the supermarket about what kind of margin you get.

***Participant***

Yeah, because there's even another level, you supply to a big thing, and they are supplying to the supermarket.

***Interviewer***

Well, and the final element, but it might also relate to what we discussed in viability, but the stability. I have defined as a what can internally be done in the system to make the system as stable as a whole from internally. I'm not if you've seen if the system is not stable at some elements or...

***Participant***

The thing that comes to mind is... Yeah, [if I think about] New Zealand, but Switzerland's already also quite export based in terms of cheese, and so they depend so much on the international market, which dictates the prices. So that's something difficult to, I suppose, I don't know if it's something that they managed with subsidies in Europe, but I know that in New Zealand the impacts of fluctuating export prices is massive on the farmers. And there's not really any mitigate-, it's hard to put mitigation in place to. I don't know what that answer to that is, I don't know how that's managed in Europe I.

***Interviewer***

Yeah, I'm to be fair, I'm not really sure about the export policies. Most people I've interviewed say there needs to be a more level playing field concerning export of products.

***Participant***

How do you mean a level playing field?

***Interviewer***

Maybe that's more import-related, but maybe also export-related to other parts of the EU, because in the Netherlands chickens need to have the *Beter Leven* quality mark, so it means that they need to be able to go outside, I believe “only” 6 chickens per square meter, for example, which makes the price higher. If you want to export that to another country which do not have those regulations in place, other countries can produce eggs for a lower price and that's what they call level playing field, at least within Europe, that those standards and regulations are equal.

***Participant***

It's not really my field of expertise this [thing].

[.....].

***Interviewer***

If I zoom out, do you feel like we didn't address something?

***Participant***

I don't know. [You needs something else to answer that]

# Appendix C – First iteration SA tool

## Business Model

### Economic sustainability criteria

Technological innovation for animal health	To which extent are sensors being implemented and used in stables to monitor animal welfare?
Fair margin	To which extent are the margins that farmers receive enough to sustain and grow their business?
Policy making for financial security	To which extent are policies consistent over time, so that farmers can recoup sustainability investments made?
Local production and consumption	To what extent are farmers able to produce critical resources themselves in times of need? To which extent do clear and understandable labels exist that food companies and farmers can put on their product to signal to consumers their product is of high quality and produced sustainably.
Quality and sustainability indicators	To which extent is the additional value that the product provides factored into the price of a product?
Innovative value capture mechanisms	

### Institutional sustainability criteria

Feasibility check	To which extent are feasibility checks part of the policy-making process?
Guidance	To which extent are governments offering assistance to farmers to implement policies? To which extent do the actors in value chain feel they can exert influence on the decision-making process regarding the sustainable development of the value chain?
Collaborative decision-making for sustainability	
Agility and experimentation	To which extent do companies and knowledge institutions have the opportunity to learn from past experiences without immediately discontinuing projects if something fails?
Critical infrastructure	To which extent is the food chain considered as a critical infrastructure by the European Union?

### Environmental sustainability criteria

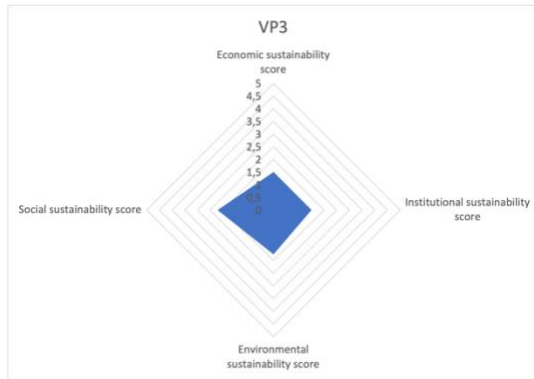
Emission reduction	To which extent have measures been taken to reduce or prevent emissions on the farm-level? To which extent have measures been taken to reduce or prevent waste by the actors in the value chain?
Waste reduction	
Land exhaustion	To what extent do the processes and agricultural practices used contribute to preventing land degradation?

Antibiotic use	To which extent are alternative technologies being used to reduce the use of antibiotics?
Innovative sustainability standards	To which extent do companies develop and make use of voluntary sustainability standards that exceed existing sustainability standards?
<b>Social sustainability criteria</b>	
Animal characteristics	To which extent are the animals that are being kept resilient to change? Are animals being kept according to the EU's regulation on five freedoms? <ul style="list-style-type: none"> <li>•freedom from hunger and thirst;</li> <li>•freedom from discomfort;</li> <li>•freedom from pain, injury and disease;</li> <li>•freedom to express normal behavior;</li> <li>•freedom from fear and distress.</li> </ul>
Animal wellbeing	To which extent do farmers feel a sense of community and belonging in their current environment?
Social communities in a local ecosystem	To which extent are farmers able to have interactions with the general public?
Media	
Food security	To what extent are the products produced in the value chain affordable for the average consumer?

# Appendix D – Sustainability assessment results

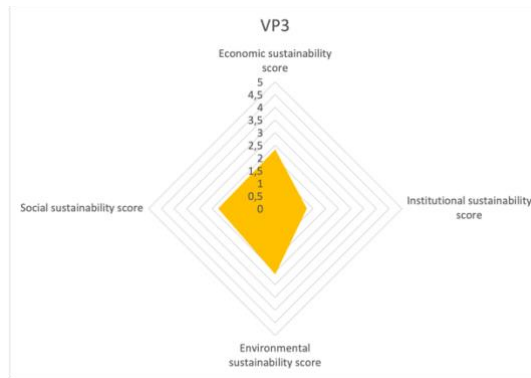
**Figure D.1**

*Sustainability assessment results business model 3, by researcher 1*



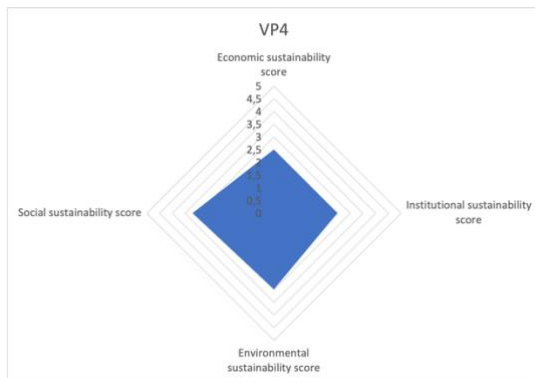
**Figure D.2**

*Sustainability assessment results business model 3, by researcher 2*



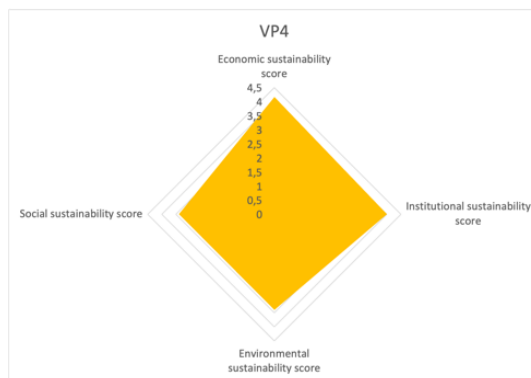
**Figure D.3**

*Sustainability assessment results business model 4, assessment by researcher 1*



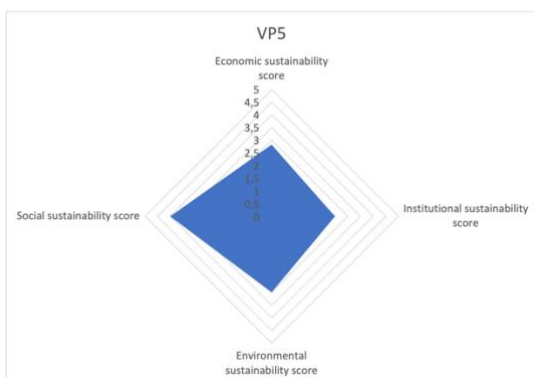
**Figure D.4**

*Sustainability assessment results business model 4, assessment by researcher 2*



**Figure D.5**

*Sustainability assessment results business model 5, assessment by researcher 1*



**Figure D.6**

*Sustainability assessment results business model 5, assessment by researcher 2*

