

Project: 101060645 — BEATLES — HORIZON-CL6-2021-FARM2FORK-01



CO-CREATING BEHAVIOURAL CHANGE TOWARDS CLIMATE-SMART FOOD SYSTEMS

D 1.4 Co-Creation Activities v3

2025

PROJECT ACRONYM: BEATLES
PROGRAMME: HORIZON Europe
GRANT AGREEMENT: No 101060645
TYPE OF ACTION: HORIZON Research & Innovation Actions
START DATE: 1 July 2022
DURATION: 48 months



Document Information

Issued by:	Stockholm Environment Institute
Issue date:	June 30, 2025
Due date:	June 30, 2025
Work package leader:	University of Copenhagen (UCPH)
Start date:	July 1, 2022
Dissemination level:	Public

Document History

Version	Date	Modifications made by
0.1	08-06-2025	Draft version by SEI and reviewed by AEIDL, AUA, FBCD, DELPHY, NATURLAND, NTUA, WUR, INTIA, AFD
0.2	26-06-2025	Revised version by SEI and reviewed by AEIDL and AUA
1.0	29-06-2025	Final version for submission to the EC

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Executive Summary

The BEATLES project, running from 2022 to 2026 under the Horizon Europe program (Grant Agreement No. 101060645), aims to accelerate the transition to Climate-Smart Agriculture (CSA) within the EU. The project aligns with EU strategies such as the Farm to Fork Strategy, the Green Deal, and the Common Agricultural Policy (CAP). BEATLES focuses on co-creating innovative pathways towards achieving CSA practices through participatory processes involving multiple stakeholders across five Use Cases in Lithuania (wheat farming), Denmark (pig farming), the Netherlands (onion and potato farming), Germany (organic dairy farming), and Spain (organic apple farming). The BEATLES project aims to facilitate the systemic transition to CSA by addressing the complexities of stakeholder needs, market dynamics, and policy frameworks. Through continuous co-creation and knowledge exchange, the project strives to create sustainable and resilient agri-food systems aligned with the EU's climate goals.

Utilizing a Multi-Actor Approach (MAA), including Living Labs, the BEATLES project engages stakeholders in annual co-creation workshops (CCWs) to co-create solutions that facilitate CSA implementation. The project is structured around five Work Packages (WPs) addressing different aspects of the transition to CSA: identifying 'lock-ins' and 'levers' for CSA adoption, conducting behavioural experiments with stakeholders, assessing environmental, economic, and social impacts, developing fair business models and market conditions, and providing policy recommendations and tools.

In 2023, BEATLES engaged over 80 stakeholders across five CCWs at Use Case level. These workshops discussed value chains, sustainability practices, and policy alignment, and the 'lock-ins' or challenges and 'levers' or opportunities in the transition to CSA practices. The identified 'lock-ins' and 'levers' were varied in terms of scope and importance – policy and institutional, technical, financial, and social. Major 'lock-ins' included a lack of capacity, consumer interest, and policy support, while the levers highlighted included sustainable practices, customer awareness, and carbon taxes.

The 2024 workshops engaged 60 stakeholders and focused on Work Packages 4 (fair business models and practices) and 5 (policies) of the BEATLES project, addressing fair business models and policy support respectively. These workshops also tabled 5 selected CSA practices in each Use Case (25 in total) and their envisaged implementation for the future purposes of the project. The five CCWs explored stakeholder perspectives on fairness in value chains, identified changes needed for fair value propositions and business models, and mapped changes on an impact feasibility matrix to prioritize actionable strategies. Policy support for CSAs involved reviewing barriers and incentives for CSA adoption and recommending policy interventions for each Use Case. For Denmark, the recommendations included a national carbon tax, biogas production, and slurry management. Lithuania's recommendations focused on investment in climate-smart strategies and support for small farms. In the Netherlands, a long-term policy vision and support for 'On the way to Planet Proof' certification were advised. Spain's recommendations emphasized technical training and research into local apple varieties.

The 2025 CCWs, reported on in this deliverable, focused on WP3 (environmental, economic and social sustainability) and WP4, further investigated fair business models and frameworks. The level of maturity and focus of the discussions was exemplified in the Danish Use Case where efficient ventilation was the emphasis including a study visit to one of the top specialist companies in Denmark. In Germany, the workshop debated the comparisons between conventional and organic approaches to dairy farming indicating that the comparisons produce different results depending on the system boundaries that are being taken into account. In the Netherlands the focus was on mechanical weed

management in the cultivation of table potatoes and the use of specialised compounds to control potato blight (mold). Optimization of marketable harvest per unit area of agricultural land is in itself a climate smart practice. In Spain the workshop was capped off with a discussion focussing on making use of nature-based agroecology knowledge in disease and pest management, water management and even marketing of the products.

WP3 provided an enlightening overview of the big picture on sustainability – itemizing the various components and parameters that make up the environmental, economic and social nexus. The results of the survey showed how stakeholder attitudes and their knowledge base are central to the challenges in increasing the use of climate-smart practices in agriculture.

WP4 continued its research among stakeholder attitudes and knowledge in the area of fair business practices and models within the context of climate-smart sustainable agriculture. Indeed, the debate as to how to share the costs of CSA practices within the food system value chains is not resolved and cannot be solved purely through market mechanisms. The dimension of policy (WP5 within BEATLES) is central to ensuring that CSA finds permanency within the sector. Across all five Use Cases, the validation exercises revealed strong stakeholder support for models promoting transparency, shared responsibility, and collaborative innovation. However, common challenges—such as funding, data governance, certification complexity, cultural resistance, lack of a common understanding of what constitutes CSA—must be addressed. Future implementation efforts should prioritize education, stakeholder alignment, phased development, and robust monitoring to ensure effectiveness and long-term sustainability.

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List of Abbreviations, Terms and Definitions

Abbreviation/Terms	Definition
AEIDL	European Association for Innovation in Local Development (Brussels)

Abbreviation/Terms	Definition
AFL	AgriFood Lithuania DIH
AUA	Agriculture University of Athens (Greece)
BEATLES	Behavioural Change Towards Climate-Smart Agriculture (https://beatles-project.eu/)
BM	Business Model
CAP	Common Agricultural Policy
CCW	Co-Creation Workshop
CSA	Climate-Smart Agriculture
DC	Danish Crown https://www.danishcrown.com/global/
DELPHY	Delphy, The Netherlands
EC	European Commission
EU	European Union
FBCD	Food and Bio Cluster Denmark
GA	Grant Agreement
GHG	Greenhouse Gases
INTIA	Navarro Institute of Agrifood Technologies and Infrastructures (Spain)
KPI	Key Performance Indicator
Levers	Opportunities, facilitator, enabler
Lock-ins	Challenges, barriers, blockages
NATURLAND	The International Association for Organic Farming in Germany
NTUA	National Technical University of Athens (Greece)
PlanetProof	On the way to PlanetProof certification scheme (The Netherlands)
SEI	Stockholm Environment Institute (Sweden)
SKOV	SKOV A/S www.skov.com/en/ (Denmark)
SMK	Stichting Milieukeur (eco-labelling institute) https://www.smk.nl/en/about-smk/ The Netherlands
UC	Use Case
UCPH	University of Copenhagen (Denmark)
Value chain	Consecutive steps or activities in the creation of a finished product
WP	Work package
WR	Wageningen Research (The Netherlands)
WUR	Wageningen University and Research (The Netherlands)

1. Introduction

1.1 Background and methodology

The BEATLES project¹ (2022-2026) aspires to change the way agri-food systems currently operate and to accelerate the systemic and systematic transition to Climate-Smart Agriculture (CSA)² and smart farming³ technologies. CSA refers to agricultural systems that increase food security in the face of climate change, enhance adaptive capacity of farmers to the impacts of climate change, and mitigate climate change where possible.⁴ Transition to CSA is to be fully aligned with the ambitions of the European Union (EU) Farm to Fork and Biodiversity Strategies, the Vision for Agriculture and Food⁵, the Green Deal (Climate Neutrality by 2050), the Common Agricultural Policy (CAP) 2023-2027 at national and EU levels, and the EU Data Strategy and Digital Compass.

There is increasing interest within the EU in generating and mainstreaming new knowledge on innovative CSA practices. However, implementation of CSA practices requires a deep understanding of stakeholder needs, robust training, and effective transfer of knowledge, which makes transition to CSA a complex process. Knowledge is used here to refer to data, information, and wisdom.⁶ The complexity of the transformation process and the need to acknowledge and enable multiple pathways with sometimes conflicting goals warrants special attention.⁷ This was not sufficiently articulated within the EU Farm to Fork strategy and constitutes a major shortcoming. Agricultural innovations have been shown to respond better to local challenges when they are co-created through participatory processes.⁸ Co-creation activities offer a platform wherein value chain stakeholders can deliberate on multiple conflicting goals and trade-offs. Co-creation activities with value chain stakeholders also have the potential of generating an integrated development agenda that takes the needs and expectations of stakeholders into consideration.⁹

Co-creation is a central part of the BEATLES project¹⁰ as it serves as a link between the project work packages (WPs), the Use Cases and their various value chain stakeholders in the following countries:

- Lithuania (wheat farming), led by AgriFood Lithuania DIH (AFL)
- Denmark (pig farming), led by Food & Bio Cluster Denmark (FBCD)
- The Netherlands (onion and potato farming), led by DELPHY

¹ <https://beatles-project.eu/>

² Climate-Smart Agriculture <https://www.fao.org/climate-smart-agriculture/en/>

³ Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things – for tracking, monitoring, automating and analysing operations (<https://tinyurl.com/yp76sssn>)

⁴ Rosenstock et al. (2016). The scientific basis of climate-smart agriculture: A systematic review protocol. CCAFS Working Paper no. 138. Copenhagen, Denmark.

⁵ https://agriculture.ec.europa.eu/overview-vision-agriculture-food/vision-agriculture-and-food_en

⁶ Utter et al. (2021). Co-creation of knowledge in agroecology. *Elementa: Science of the Anthropocene* 9 (1): 00026. <https://doi.org/10.1525/elementa.2021.00026>

⁷ Eliasson et al. (2022). Transformations towards sustainable food systems: contrasting Swedish practitioner perspectives with the European Commission Farm to Fork Strategy. *Sustain Sci* 17

⁸ FAO, Agroecology Knowledge Hub www.fao.org/agroecology/knowledge/10-elements/co-creation-knowledge/en/?page=114&ipp=5&tx_dynalist_pi1%5Bpar%5D=YToxOntzOjE6IkwiO3M6MjoiMTAiO3O%3D

⁹ Givertz et al. (2017). 'CSA-Plan': strategies to put Climate-Smart Agriculture (CSA) into practice. *Agriculture for Development* 30:12-16.

¹⁰ <https://beatles-project.eu/use-cases/>

- Germany (organic dairy farming), led by The International Association for Organic Farming in Germany (Naturland)
- Spain (organic apple farming), led by Navarro Institute of Agrifood Technologies and Infrastructures (INTIA)

The BEATLES project calls for a Multi-Actor Approach including “Living Labs”¹¹ for co-creation. This involves multi-stakeholder engagement and interaction in a forum or CCWs representing the value chain, targeting sustainable and innovative climate¹² functions as a base for the Living Labs. BEATLES has held 15 CCWs over the past three years and gained valuable experience on how these are to be organised and carried out. In addition, the Work Packages have made use of the Use Cases as a stakeholder base for their research and they participate in the learning and knowledge exchange that characterises the co-creation agendas in the annual CCWs run by the Use Case lead agencies. For BEATLES, the following components have been included in taking the Living Labs, multi-actor approach:

- agenda co-creation by the UC and WP leads for the five annual workshops
- training and bilateral preparatory meetings with Use Case coordinators
- running the workshops by the UC leads in the respective countries
- writing of reports by the UC leads for each workshop
- production of an annual project deliverable summarising the results of the workshops

The items tackled in the annual CCWs are closely linked to the activities within the various Work Packages:

- general overview on ‘lock-ins’ preventing and ‘levers’ promoting the adoption of CSA practices and technologies specific to the five Use Cases (Work Package 1, led by University of Copenhagen)
- individual, systemic and policy factors surrounding the transition to CSA practices and technologies tested in behavioural experiments with Use Case stakeholders (Work Package 2, led by University of Copenhagen)
- environmental, economic and social impact assessments of implementing CSAs within the Use Cases (Work Package 3, led by National Technical University of Athens)
- market segments, fair value propositions, business model innovation and validation within the transition to CSA practices (Work Package 4, led by Wageningen University & Research)
- evidence-based policy recommendations at regional, national and EU levels, policy tools, support for agri-business advisors, mutual learning and capacity building for policy action within the context of the transition to CSAs (Work Package 5, led by AEIDL, the European Association for Innovation in Local Development).

The 2023 co-creation activities of the BEATLES project focused on the ‘lock-ins’ and ‘levers’ of the transition to CSA.¹³ The 2024 co-creation activities focused on topics within WP4 on fair business models and WP5 on policy support (D1.3). The 2025 co-creation activities focused on fairness frameworks and fair business models (WP4) plus environmental, economic and social sustainability (WP3).

¹¹ Cascone, G. et al. 2024. Promoting innovations in agriculture: Living labs in the development of rural areas. J.Cleaner Production 443 (141247) <https://doi.org/10.1016/j.jclepro.2024.141247>

¹² <https://beatles-project.eu/use-cases/>

¹³ <https://beatles-project.eu/wp-content/uploads/2024/06/D1.2-Co-creation-activities-v1.pdf>

1.2 Outcomes of the 2023 Co-Creation Workshops

Over 80 stakeholder representatives from the 5 Use Case value chains were mobilized and engaged during the first CCWs in 2023 in Denmark, Germany, Lithuania, the Netherlands and Spain. The following points were discussed at the CCWs:

- Overview of the BEATLES project and the co-creation process that will run until 2026
- The Use Cases and related value-chain components in detail
- The stakeholders and their niche roles within the value chains
- The baseline situation and practices for each of the Use Cases regarding value chain sustainability, markets/business and policies
- The possible CSA-related transitional changes along the value chains and the potential impacts on sustainability, markets/business and policy alignment
- The 'lock-ins' and 'levers' related to the process of CSA reform providing recommendations regarding these barriers and opportunities
- Items for follow-up in future exchanges and CCWs e.g. adding more stakeholders and additional topics.

The following general 'lock-ins' preventing and 'levers' promoting the transition to CSA practices were highlighted during the 2023 CCWs:

'Lock-ins'

- Lack of capacity, knowledge and training on the part of stakeholders hinders progress towards developing CSA practices
- Consumer interest is lacking along with understanding and willingness to pay
- Cost of CSA cannot be passed down to the consumer, so subsidies are necessary
- CAP has not entered the CSA era yet - CAP tends to defeat the purpose of transitioning to CSA implementation
- EU has no common sustainability model for agriculture
- EU has yet to develop directives dealing with CSAs responding to the Green Deal and Farm to Fork strategies which at present lack implementation components
- National strategies, policies and guidelines are lacking in the area of food system CSA implementation
- EU policies dealing directly with CSA implementation are lacking
- Market interest in food systems built using CSA practices is lacking
- Countries importing from the EU do not have CSA stipulations and thus are not willing to pay extra
- The value chains are not keyed towards climate change adaptation, GHG mitigation or sustainable production
- Strategic finance for CSA investments from banks is not available
- Stakeholder interaction to create innovative solutions leading to CSA practices is lacking
- LCA carbon footprint analyses have only limited value and don't motivate the investment costs for CSA; they are also not linked to carbon taxes

'Levers'

- Sustainable practices in many cases can be economic/profitable in the long run, in terms of enhancing soil fertility, water holding capacity and building resilience against drought and wind erosion
- Growing customer awareness about climate change is a driver and proper marketing and labelling can help increase the interest in CSA-based products
- Growing customer awareness about healthy foods and eating habits that also are climate-friendly will help shift the transitions to increased CSA practices
- Improvements in value chain efficiency with reduced waste and increased recycling all lead to reduced climate change impacts

- Introduction of carbon taxes will be a major incentive to shift towards CSA practices
- The high costs of fossil fuel, electricity and fertilizer force producers to be more frugal and more efficient in their farming practices
- The relatively low costs for digitalisation can provide short cuts towards increasing efficiency and more accurate accounting of resource use
- Stricter laws concerning leakage of phosphorus and nitrogen from fields to water courses reduce the overuse of manure on fields thus reducing GHG emissions
- Revision or reform of CAP holds promise as a central catalyst to achieve the goals of the Green Deal and Farm to Fork Strategies

The specific business and policy-related lock-ins and levers including recommendations on how to address these are summarised below. These served as background for the identification of priority areas to help focus on in the formulation of the 2024 co-creation workshop agendas.

In terms of business models and market conditions, the reported lock-ins included lack of consumer interest and willingness to pay extra for CSA, low interest in food produced using CSA, and the absence of strategic finance from banks for CSA. To overcome these challenges, it was recommended that CSA practices should be made economically feasible to facilitate adoption. This relates to the need to carefully consider prices for CSA products that customers will be willing to pay. The potential of using carbon taxes to incentivise stakeholders to shift towards CSA was highlighted as a major lever. A sustainability reporting system was suggested as a way for banks to nudge value chain stakeholders to engage in CSA practices.

Regarding policy, the reported lock-ins were mainly related to lack of policies and directives that promote and regulate CSAs at EU and national levels. Several recommendations were made on how to address this gap. The most important recommendations that were raised are the following: the Common Agricultural Policy (CAP) needs to incorporate CSA practices in order to promote the Green Deal and its Farm to Fork Strategies, a shift from financial support to assisted knowledge support to farmers is needed, climate tax must be easy to interpret and use, and advocacy for CSA should be supported at national and EU levels. The main reported lever is in relation to CAP which holds promise as a central catalyst to achieve the goals of the Green Deal and Farm to Fork Strategies. Recommendations on how to harness this lever are the following: CAP needs to be more comprehensive and focus more on promoting niche green practices, CAP support should be oriented towards sustainability results and made easily accessible for farmers developing sustainable agricultural practices.

1.3 Outcomes of the 2024 Co-Creation Workshops

The 2024 workshops which attracted 60 participants, focused on Work Packages 4 and 5, addressing fair business models and policy support, respectively. These workshops also tabled 25 selected CSA practices and their implementation in the five Use Cases, this for the future purposes of the project. The five co-creation workshops explored stakeholder perspectives on fairness in value chains, identified changes needed for fair value propositions and business models, and mapped changes on an impact feasibility matrix to prioritize actionable strategies. Policy support for CSAs involved reviewing barriers and incentives for CSA adoption and recommending policy interventions for each Use Case. For Denmark, the recommendations included a national carbon tax, biogas production, and slurry management. Lithuania's recommendations focused on investment in climate-smart strategies and support for small farms. In the Netherlands, a long-term policy vision

and support for 'On the way to PlanetProof' certification were advised. Spain's recommendations emphasized technical training and research into local apple varieties.

Recalling from the previous year's CCWs in 2024, the workshops tackled fair value propositions and fair business models and provided suggestions regarding what changes are necessary to create greater levels of fairness. The following (Table 1) summarises the suggested changes put forward by the stakeholders in each Use Case.

Table 1. Summary from the 2024 CCWs covering suggestions to achieve improved fairness within the Use Case value chains

Use Case	Suggestions to achieve greater levels of fairness in the value chain
Denmark	Align incentives with biological processes to enhance sustainability. Strengthen connections between consumers, retailers, and manufacturers. Improve ESG reporting to promote climate-friendly products. Retailers must actively market climate-smart goods using a back casting approach. Optimize regulations and provide practical knowledge to both policymakers and consumers. Highlight the impact of Community Supported Agriculture in ESG terms.
Germany	Define fairness and climate-smart practices holistically. Support small farms with origin labelling and fair subsidies. Educate consumers through honest marketing. Reform market regulations, including public procurement. Ensure planning security and fair oversight by the cartel office. Remove taxes on organic staples and apply uniform import rules.
Lithuania	Restructure financial support to favour climate-friendly and organic farming. Build consumer trust in organic labels and improve access to new technologies for farmers. Choose effective cultivation methods and adapt to geopolitical changes. Foster cooperation among small and medium farms to boost competitiveness.
Netherlands	Reward growers for the extra costs of sustainable production and ensure fair profit margins. Increase transparency in the value chain. Reduce regulatory burdens and support sustainable practices. Ensure growers benefit more from initiatives like On the way to PlanetProof.
Spain	Promote consumer cooperatives and short supply chains. Use collective solutions for storage and processing. Raise awareness of local, sustainable products. Invest in efficient machinery and sustainable practices. Support research on local fruit varieties and ease sanitary processing regulations.

1.4 Brief objectives and expectations of the CCW

The CCWs focussed on addressing content identified by the BEATLES Work Packages 3 and 4. WP3 (Sustainability) deals with LCA-based evaluation of systemic innovations on environmental, social, and economic benchmarks. WP4 (Transition toward fair business models and shaped market conditions) deals with fair value propositions and business models that will match the market segments' needs, identified via segmentation analysis. The CCW aimed to collect relevant and useful input and data from the Use Case to complete the overall objectives of these WPs in BEATLES. To ensure a more coherent workshop, the participants were given a short overview of all objectives related to WP4 and then WP3 afterwards.

1.5 Base agenda for the 2025 Co-creation Workshops

The generic agenda was drafted by the BEATLES Task 1.3 team with inputs from the WP 3 and 4 project members. The WP leads provided the objectives, expectations, and structure of their various sessions in line with their various work plans. The generic agenda was then shared with each of the BEATLES Use Case leads for their inputs in making the agenda specific to their various contexts. The five Use Case adapted the agenda to their various contexts and value chain priority areas. WP3 focused on a sustainability framework including environmental, economic and social parameters and WP4 with its work on fairness norms and attitudes in business and the development of fair business models. The context specific agendas were shared and discussed with Task 1.3 and WP 3 and 4 team members in CCW preparatory meetings. Following these preparatory meetings, some adjustments were made in the content and structure of the various agendas before they were finalised. It was agreed during the preparatory meetings that the invitation of experts to give a talk on CSA themes of interest to the various Use Cases would be strategic in getting stakeholders interested in joining the CCWs. The final context specific agendas were then translated to the various local languages and sent together with an invitation to the relevant value chain stakeholders to join the CCWs.

The generic agenda was as follows:

1. **Welcome and who is who in the meeting** (farmers, advisors, policy makers, researchers, others) (including expectation from participants)
2. **Summary of results** of the farmer and consumer segmentation studies from the BEATLES project, **quick review** of the previous two co-creation workshops and the **present focus** on WP3 and WP4 in this workshop (including expectations)
3. **Brief description of the Use Case**
 - a. defining the UC scope and system boundaries
 - b. brief technical description of the 5 CSAs chosen by WP3 identifying those to emphasise during the workshop (**in bold**)

Table 2. Selected CSA practices per UC (background information)

UC1 (Lithuania – wheat cultivation)	UC2 (Spain – organic apple orchards)	UC3 (Germany – organic dairy farms)	UC4 (Denmark – pig farming)	UC5 (The Netherlands – onion and potato cultivation)
Intercropping	Cover crops	Organic/Naturland standards	Frequent discharge of slurry	Sustainable irrigation systems
No-tillage system	Floral bands	Feed conversion to 100% forage	Acidification of slurry	Green energy
(Extensive) wetland management	Grazing	Regional protein source	Use of biogas	Precision fertilization and soil management
Alternative green energy	Organic farming	Breeding for longevity	Green protein for feed	Biodiversity measures (farm level)
Precision farming	Renewable energy	Agrophotovoltaic systems	Technologies for ventilation	Crop protection (all IPM measures)

4. **External speaker or other activity** e.g. round-table stakeholder discussion on sustainability and business models (consider inviting a speaker who will give a talk on a salient topic that would catch the interest of stakeholders)
5. **Validation of a Sustainability Framework tailored to each UC**

Introduction to the Sustainability Framework (5 mins)

Introduce the WP3 sustainability framework, explaining its role in comparing and improving agricultural practices.

Presentation of Selected Key Impact Indicators (15 mins)

Presentation of the main environmental, economic and social impact indicators.

Survey to Weight Sustainability Framework Parameters (25 mins)

Survey asking the participants to weight the sustainability framework parameters according to their perceived relative importance.

6. Fair business practices, norms, business relations – validation of a “fairness framework”

A 15 minute PPT presentation by the UC lead is made summarising answers to the following questions:

- a. Short analysis of fairness of the case will be provided. What are the most important fairness issues in the chain with respect to implementing CSAs according to you?
- b. What are the main ‘value attributes’ that the chain is currently exploiting in the market (i.e. organic, local, good taste, good quality, low price etc)?
- c. Are there any premiums paid to farmers for CSA practices, or differentiated prices (e.g. for organic), and/or subsidies?
 - How does that work?
 - How high are they and what costs do they cover?
- d. How is the chain organized in terms of negotiations and contracts?
 - What is the normal term of the contracts (day trading, monthly forward contracts, annual contracts etc.)?
 - Are farmers actually negotiating prices or do the buyers dictate prices?
 - Is there a reference price (e.g. world market price)?
 - Are CSA practices part of negotiating and contracts?
- e. How are contracts monitored and enforced? (formal versus informal contracting and monitoring)?
- f. Do buyers (or input suppliers) provide other (technical) assistance or investment support for CSA to farmers?
- g. What role do quality control and sustainability certification play?
- h. How is the communication between farmers and buyers?
 - How do farmers and buyers communicate/interact?
 - How often do they interact?
 - What is being discussed?
- i. How is the information sharing between the actors?
 - Which information is being shared by farmers with buyers?
 - Which information is being shared by buyers with farmers?
 - Is that useful, important for CSA or fairness?
- j. Do the actors understand each other’s position and needs, and is there mutual respect between the actors in the chain?
- k. What other practices are in place to make the chain fair? What other practices make the chain unfair?

7. Discussion providing feedback and Quick survey on norms and fairness perceptions where the stakeholders grade various statements on a scale of 1 to 6.

8. Validation of fair business models for the transition to implementing CSA

- a. **Presentation** of the 3-4 fair business models chosen for the Use Case including the description and examples from the Use Case (10 mins)
- b. **Group exercise** to validate the chosen fair business models by holding 3 structured discussions dealing with the relevance (scored high or low), plausibility (scored high or low) and challenges (statements by the stakeholders) for each of the chosen business models (including their description (25 mins)
- c. **Summary discussion** (10 mins)

9. **Wrap up** – take home messages by the rapporteur including reflections from participants

Training sessions were organised with each of the Use Case leads and the WP teams. The purpose was to provide guidance to the Use Case leads on how to successfully run the sessions and obtain the expected outcomes. During these sessions, the WP leads introduced the design and methods of their various sessions and reflected on the potential challenges related to the participation at the CCWs, duration of the sessions, and understanding of the exercises by participants. The training sessions contributed to the successful implementation of the CCWs by all the Use cases.

1.6 Participation at the 2025 Co-creation Workshops

The CCWs were held in February and March 2025 in each of the five Use Case countries. The stakeholder participants at the workshops included farmers, retailers, technology providers, policymakers, advisors, government representatives, consumer representatives, breeders and processors (Table 3). Although the KPI for the CCWs is 15 participating stakeholders for each of the five workshops each year., the running average between 2023 and 2025 has been 14.2. In 2023 the average was 16. The average for 2025 was 15..

Table 3. Schedule and stakeholder participation at the five CCWs held in 2025

Use Cases	Date of CCW	Value chain stakeholders represented (including numbers)	Participants
Wheat farming, Lithuania	26/3 2025, Hotel Pacai	Farmer (4) , farmer association (1) , technology provider (1) , policymaker/govt (5) consumer organisation (1) advisor (4)	16
Organic dairy farming, Germany	14/3 2025, Farm in Grabenstätt	Farmer (3) , breeding association (1) , dairy processing (2) , advisor (5) , policy/government (2)	13
Pig farming, Denmark	7/3 2025, SKOV A/S	Farmer (1) , policymaker (1) , technology provider (4) , advisor (4) , vocational training (1)	11
Organic apple farming, Spain	1/4 2025	Farmer/processor (1) , farmer (8) , advisor (4) , consumer org (2) , marketing association (1) , commercial advisor (1)	17
Onion and potato farming, Netherlands	12/3 2025, Klaaswaal	Farmer (5) , auctioner (1) , advisor (4) , trader (6) , certifier (1) , consumer organisation (1)	18

2. Use Case descriptions and Co-creation Workshop agendas

2.1 Choice of CSAs for each Use Case

In 2024 each Use Case was tasked with choosing five priority CSA practices that would be tackled by the BEATLES Work Packages and in the CCWs in 2025 and 2026. These CSA's are presented here in Table 4 for the purpose of continuity within the BEATLES co-creation process.

Table 4. CSA practices and technologies identified by the BEATLES Use Cases sorted by category (green-shaded cells show occurrence)

CSA category	specific CSA practice or technology	participating BEATLES Use Case				
		Denmark	Netherlands	Lithuania	Germany	Spain
energy management	solar power		x	x	x	x
	methane reuse	x				
manure management	slurry acidification	x				
	pen/barn ventilation	x				
	slurry cooling	x				
	frequent emptying of slurry	x				
Soil management	composting					x
	minimal/no tillage			x		
	targeted fertilizer application		x	x		
	soil fertility		x	x	x	x
	soil conservation			x	x	x
	precision agriculture		x	x		
	carbon sequestration		x	x	x	x
Water management	conservation measures		x			
Livestock management	breeding				x	
	longevity and welfare				x	
	improved nutrition				x	
	less waste				x	
	rotational pasture grazing				x	
	specialized feed formulations				x	
Crop diversification	green feed	x				
	green manure		x			x
	rotation					x
	nutrient offtake optimized		x			
	perennial grasses/trees				x	
	legumes				x	
	cover crops		x			x
intercropping			x			
Pest/weed management	integrated pest management		x			x
	chemical applications		x			
	floral bands					x
	grazing					x
Waste and runoff management	composting					x
	wetland management			x		
	riparian buffer zones					

CSA category	specific CSA practice or technology	participating BEATLES Use Case				
		Denmark	Netherlands	Lithuania	Germany	Spain
	reduced runoff		x			
Transportation	local feed production				x	
	local markets				x	x

Each of the BEATLES Use Cases was requested to briefly update the description of the value chain components or Use Case profiles (outlined in the next section) and provide some relevant statistics to set the scene for each of the CCWs. In addition, they were each tasked with selecting five most relevant CSA practices/technologies to be used in the various WP in-depth work.

2.2 Use Case Lithuania value chain wheat farming

2.2.1. Use Case Profile

Agriculture plays a significant role in Lithuania's economy, with 45% of the country's total area dedicated to agricultural use. Among various crops, wheat is one of the most important, both in terms of domestic consumption and export. In 2022, Lithuania produced approximately 6.014 million tonnes of grain, a key contributor to the country's agricultural output. The wheat sector, in particular, has been a major driver of economic growth, benefiting from favourable climatic conditions and modern farming techniques. In 2023, Lithuania exported about €1.4 billion worth of wheat, positioning itself as the 12th largest wheat exporter globally. This highlights the country's strong presence in the international grain market. Furthermore, wheat was the 3rd most exported product in Lithuania in 2023, emphasizing its importance to the nation's trade balance (Tomas Balezentis et al., 2021; Eurostat, 2022; European Network for Rural Development, 2021). Figure 1 illustrates the value chain of the Lithuanian wheat farming.

Regarding Lithuanian wheat farmers, only 6% of farmers are young (under 35 years), while over a third are aged over 64, with young female and male farmers managing an average of 70 ha and 78 ha respectively (Tomas Balezentis et al., 2021). According to Eurostat data, the gender imbalance between men and women is relatively low, with women accounting for 44.9% of farmers in Lithuania. In a study conducted by Tomas Balezentis et al. (2021) on young farmers (under 40 years old) in crop farming, women made up 47% of farmers compared to 54% for men (based on utilized agricultural area in hectares). Additionally, the study found that 76% of young female farmers reported having a higher education degree, compared to only 56% of young male respondents.

Overall, wheat farming is a crucial practice in Lithuania's agricultural sector and an important aspect of the country's economy. Strong export performance, relatively balanced gender distribution in farming participation, and an emerging skilled younger generation of farmers set a strong foundation for the wheat farming Use Case.

The shift to CSA faces additional challenges, including farmer reluctance to change, consumer unwillingness to pay more for sustainable products, lack of business incentives, unclear policies, and difficulties in obtaining necessary technologies. Addressing these barriers from individual, systemic, and policy perspectives would encourage sustainable practices, reducing GHG emissions, improving soil health, and enhancing farm productivity and economic performance. Socially, this would boost rural community wellbeing and sustainable rural economic development, promoting wider adoption of climate-smart practices.

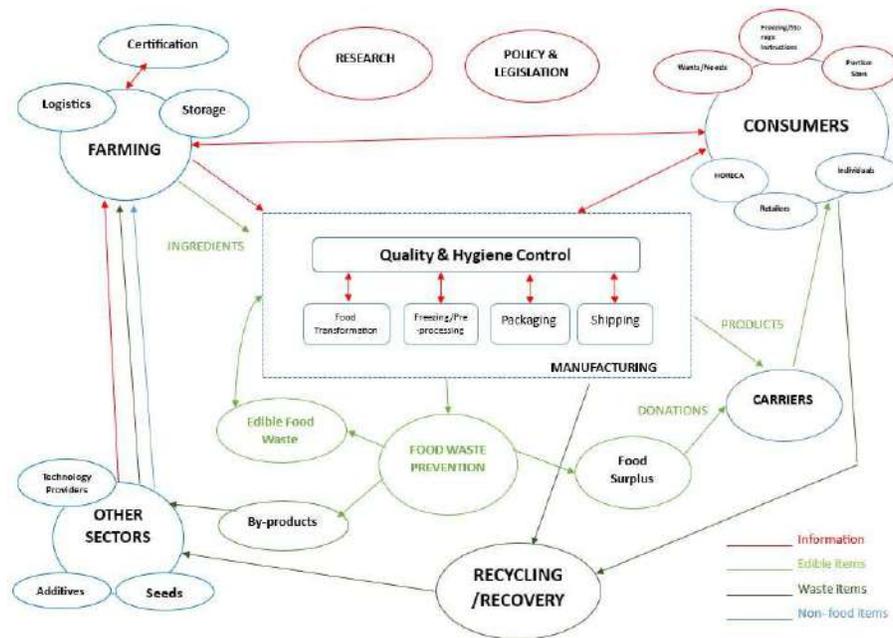


Figure 1. Value chain of the wheat farming Use Case in Lithuania

2.2.2. CCW agenda

AgriFood Lithuania hosted the 3rd CCW on March 26th, 2025 with 16 participants.

The agenda of the workshop was as follows:

- Introduction and presentation of objectives and expectations of the workshop by the UC leads.
- Presentation of brief overview of the results of the BEATLES project.
- Session 1: Identifying relevant sustainability parameters in the onion and potato use case value chain: introduction to the sustainability framework, presentation of Selected Key Impact Indicators, weighting of the Sustainability Framework Parameters
- Session 2: Validation of the fair business model and evaluation of fairness framework
- Participant feedback survey
- Wrap-up and take-home messages

2.3 Use Case Germany value chain organic dairy farming

2.3.1. Use Case Profile

The dairy production in South Bavaria is characterised by mountainous landscapes and rather small-scale production. Traditionally in this area, cows are kept on pasture during summer from April to October and in winter in stables in tethered housing. While this is no longer allowed for new stables and only in exemptions for existing buildings, many older farmers have stopped dairy farming in this region. Other farmers and their families rely on additional income through tourism or other occupations. Average herd size in Bavaria for all farms is 45 cows with annual yields of 7,766 kg milk per cow (numbers from 2022/2023 by [Milchreporte Bayern - Ergebnisse der Betriebszweigabrechnung \(BZA\) - LfL](#)), which is lower than the German average of 73 cows per farm and 8,780 kg milk per cow. Most commonly in Bavaria, Fleckvieh is used as breed, which is a dual use breed, while especially

in the North of Germany mostly Friesian Holstein is used which is a breed specialized for milk production and therefore resulting in higher yield. The area of South Bavaria is characterized by grassland and therefore, most of the dairy production is linked to the use of grassland, but there are also exemptions.

The dairy is structured as a cooperative, with part of the products being certified based on organic criteria. Among the organic certification, the company produces Demeter-certified products¹⁴ as well as Naturland Fair certified products. Of the 1800 dairy farmers of the cooperative, 650 are producing according to Naturland or Demeter standards. This means parts of the cooperative members are members of the Naturland association, which is also issuing the Naturland Fair certification and is in charge of organising the Use Case for the BEATLES project. For differences between the European organic certification and the private label Naturland refer to CCW report 1 (Deliverable 1.2 2023)¹⁵.

The supply chain of the UC is described in Figure 2:

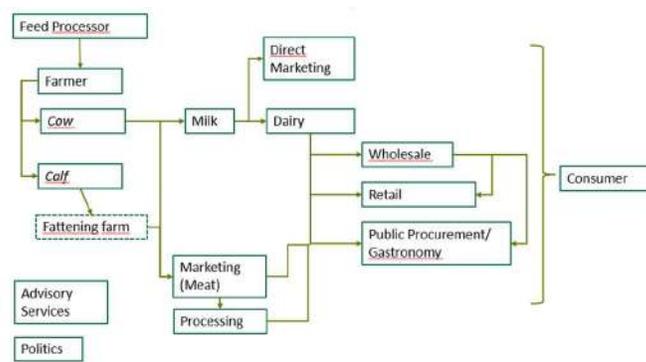


Figure 2. Value chain for the organic dairy farming Use Case in Germany

2.3.2. CCW agenda

The BEATLES CCW took place on the 14th March 2025 in Grabenstätt, close to lake Chiemsee in South Bavaria, with 13 participants.

The agenda of the workshop was as follows:

- Farm visit (Grabenstätt) and discussion about how the farm can improve its CO₂ footprint and overall sustainability
- Discussion on CO₂ footprint from dairy farms and limits of the calculation tools
- Session 1: WP 3 - Validation and survey of the sustainability framework
- Session 2: WP4 – Validation and survey of the fair value chain practices and attitudes and validation of the fair business models
- Participants feedback survey of the workshop
- Wrap-up and take-home messages

As part of the next steps for the preparation of the 2026 CCWs, the participants at the CCW in Germany suggested that the Use Case should focus on milk production on grassland which is typical for their region regardless of conventional or organic production systems. They also stressed that willingness of consumers to pay for organic food and the dependence of the sector on local politics are issues that they would be interested to further discuss.

¹⁴ Quality certification. <https://demeter.net/demeter-products/>

¹⁵ <https://beatles-project.eu/wp-content/uploads/2024/06/D1.2-Co-creation-activities-v1.pdf>

2.3.3 Farm visit in Grabenstätt

The farm that was visited is certified according to Naturland organic and EU-Organic standards. It covers an area of 70 hectares and 57 cows are kept on the farm. Cows have direct access to a pasture during summer that is directly linked to the stable. The farm uses an automatic milking system (Lely robot), which was installed in autumn 2024. This is not common, since the pasture needs to be close to the stable to provide 24 hours access to the milking robot. The grassland on the farm is cut 5-6 times per year with some parts of the grassland being used extensively and only cut after the 15th of June to increase biodiversity. Feed is conserved in silage (sandwich silage) with 25% corn to increase the yield and provide enough energy for cows. The stable is a 3-row runway including a milking robot and a butler to keep feed close to the cows. During the farm tour, participants asked questions to better understand the farming system.

2.3.4 Discussion on CO₂ footprint calculation for the visited farm and its limitations

To give participants insights into current standards on calculation of the CO₂ footprint of farms, data on the visited farm were collected beforehand and the CO₂ balance calculated for the farm. Data collected consisted of farm-specific numbers of e.g. milk yield, replacement rate of cows and feed input. The calculator used can be found here: [Milchkuhhaltung - LfL Deckungsbeiträge und Kalkulationsdaten](#). It is developed by a Bavarian government agency. Currently, no common calculation base and calculator for climate performance from the government exists for Germany, leaving the results from different calculators between states not comparable to each other. At the moment, there is a process on agreeing on one way to calculate emissions for dairy cows for the whole of Germany.

Currently, the calculator is only available for conventional dairy farming, making the calculation of an organic farm and the interpretation of the results difficult. Within the next year, the government agency responsible for the calculator will add a calculator for organic dairy, which will have organic average numbers and processes as default options and will be more suitable towards organic feed rations. Nevertheless, for demonstration purposes, this was done for the workshop. In order to show potential advantages and disadvantages of the calculator, several scenarios were calculated for the farm to see how the CO₂ footprint of the milk would change. The scenarios calculated were: increase in yield while amount of concentrate being stable, introduction of a biogas plant to treat the manure, increase of replacement rate (since the farm already had a very low replacement rate) and reduction of concentrate feed.

The results showed the limits of the calculator and stirred a heated debate about the usefulness of a tool like this. While non-surprisingly, the increase of yield increased the emissions per cow, the emissions per product unit decreased. The introduction of the biogas plant led to the most significant reduction in the CO₂ emission. Participants nevertheless raised concerns, that biogas plants cannot only run with manure and therefore, the introduction of a biogas plant would also lead to an increased production of corn on the farm in order to feed the biogas plant and to make it most efficient – this in return might result in a decrease of farmed grassland, leading to environmental disadvantages and raising the question whether arable land should be used for the production of plant material for the biogas plant. Changes in the replacement rate also resulted in relevant changes in the CO₂ emissions of the dairy production. A decrease in concentrate feed led to an increase in the CO₂ emissions, since for the projection, no changes in the quality of the roughage feed were made which resulted in a higher methane emissions, which levelled out the CO₂ reductions from reduced concentrate feed.

In reality, a farm that reduces the concentrate feed would also improve the quality of the roughage feed which would not lead to such high increases in methane.

Additionally, through the projections and in the discussion, it became clear, that the method used for allocation the emissions of the cow on the products dairy and meat had more influence on the CO₂ emissions per product unit than actually trying to improve the emissions on the farm.

The goal of this session was to improve understanding of the calculation of the emissions on a farm as well as the way the respective tool functions. This can help to argue for organic agriculture and its advantages in relation to climate. Often, the organic sector is confronted with results of CO₂ calculators that favour conventional practices (increasing efficiency through corn silage and concentrate feed), since the increase of yield has a strong effect on the CO₂ performance per product unit. At the same time, other factors such as biodiversity or competition of feed production and food production on arable land and the benefits of grassland on humus increase are being left out by calculators.

While some participants were very sceptical regarding the usefulness of this calculator, since it is only taking into account one part of the farm while e.g. the use of the land or the amount of animals per farmland is being left out, other participants still found it interesting to understand the calculator better. One advisor, which already worked with the tool, pointed especially towards the fact that looking at the CO₂ balance can help to identify potential needs for improvement of efficiency on the farm. The representatives of the dairy pointed out that the calculator is especially unfavourable for dairies located in areas with a high use of grassland, since their emissions might be less competitive to other dairies. This is especially due to the fact that the CO₂ calculator does not reflect the advantages of producing milk from grassland.

Furthermore, participants agreed that there is a wrong communication in the German media, framing dairy farming as non-climate-friendly without taking the benefits of dairy farming on grassland into consideration. An international review of the current thinking shows that there is no agreed upon common method of comparing conventional and organic livestock farming¹⁶. Organic farming takes a much broader systems approach while conventional systems tend to take a narrower approach when assessing environmental impact.

2.4 Use Case Spain value chain organic apple farming

2.4.1. Use Case Profile

The area destined for organic production in Spain increased by 3.5% in 2020 compared to the previous year, reaching 2.4 million ha. The average annual growth trend of the eco area was 4.8% between 2015 and 2020 putting organic at 10% of the total agriculture area in Spain, highest in the EU. The objective is to reach 25% before 2030.¹⁷ Spain accounted for about one-third of the EU fruit plantations and about 8% of the area within EU-28 devoted to apple orchards.¹⁸

Farmers are the central part of the value chain, as well as the largest group in the UC. Nevertheless, different types of stakeholders and challenges across the whole value chain

¹⁶ Sanders, J. *et al.* Benefits of organic agriculture for environment and animal welfare in temperate climates. *Org. Agr.* (2025). <https://doi.org/10.1007/s13165-025-00493-w>

¹⁷ <https://www.cultifort.com/en/spain-leader-organic-agriculture-europe/>

¹⁸ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agricultural_production_-_orchards

have been identified. There is great diversity among the farmers participating in the UC, from farmers who produce apples and sell them without any processing to companies to producers who transform or store their production and sell it in shorter value chains. On the other hand, we have different processing or distribution companies, who either sell fresh fruit or process it.

In addition, the participation of researchers, consumers and advisors enriches and makes possible to address the following main topics or challenges already identified during the 2023 co-creation activities:

- Storage and calibration
- Commercialisation and local supply to industry/distribution
- Processing (juice, cider and others)
- Primary production challenges (organic production at the field level)

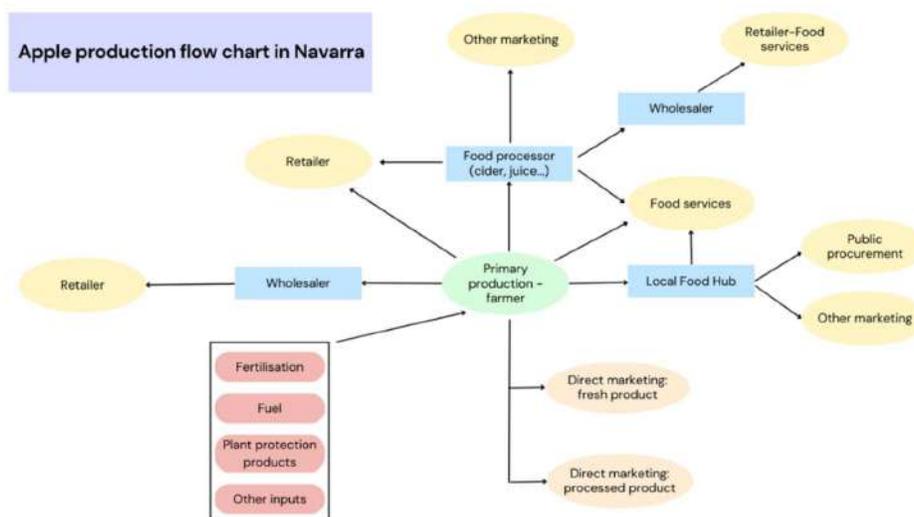


Figure 3. Value chain for the organic apple farming Use Case in Spain

2.4.2 CCW agenda

The Spain CCW took place on the 1st April 2025 with 17 participants.

The agenda was as follows:

- Introduction and presentation of objectives and expectations of the workshop by the UC leads.
- Presentation of brief overview of the results of the BEATLES project.
- Session 1: Identifying relevant sustainability parameters in the onion and potato use case value chain: introduction to the sustainability framework, presentation of Selected Key Impact Indicators, weighting of the Sustainability Framework Parameters
- Session 2: Validation of the fair business model and evaluation of fairness framework
- Participant feedback survey
- Presentation by guest speaker expert in agroecology and also an advisor and farmer
- Wrap-up and take-home messages

Participants in the Spain CCW reported that the discussions at the CCW were quite abstract and somewhat removed from the everyday practicalities of their work as producers. The producers in the Spanish CCW showed particular interest in seeing more

experimentation with the CSA practices at a local level, especially within apple cultivation. These participants were mostly interested in flower strips and managed grazing. Mid-February was proposed by participants for the 2026 CCWs in consideration for the spring fieldwork for farmers and advisors.

2.5 Use Case Denmark value chain pig farming

2.5.1 Use Case Profile

The Danish Use Case in pig production managed by Food and Biocluster Denmark (FBCD) covers large parts of the value chain - from primary production to consumer. Active players include farmers, technology providers, advisors, research institutions, municipalities and the financial sector. The sector faces key challenges, especially the reduction of greenhouse gas emissions and the need to ensure consumer confidence and willingness to buy (Danish) pork.

Pig production is one of Denmark's most important export industries. Around 90% of total production is exported and contributes significantly to the balance of payments. With around 2100 pig farms (down from 5000 over the past few years) and an annual production of 29 million pigs, Denmark supplies pork to more than 140 countries and represents 7% of the EU production of pig meat. The industry is known for its high standards in breeding, food safety, animal welfare, traceability - and increasingly, environmental sustainability. Denmark is among the most environmentally efficient producers of pork, and since 1985, CO₂ and phosphorus emissions from production have been halved, while ammonia emissions have been reduced by 73%. This has been achieved through technological improvements in ventilation, feeding, genetics and manure management.

At EU level, the pork sector accounts for 8.5% of total agricultural production, representing 35% of the market for meat products. The industry is therefore crucial for both employment and food security in Europe. At the same time, it faces significant demands to reduce its environmental impact as a result of the European Green Deal, the Farm to Fork strategy and a new Common Agricultural Policy (CAP). These policies are likely to bring new requirements for environmental management and animal welfare in production.

The future of pig production in Denmark depends on a combination of technological solutions and systems approaches. For example, more frequent slurry spreading can reduce methane emissions, while improved house climate, energy-efficient ventilation and optimised feeding can further contribute to climate improvements. A close interaction between technology development, high level of research, political support and consumer buy-in is necessary to ensure the continued sustainability and competitiveness of the industry.

Opportunities with tripartite co-operation for more sustainable pig production

Denmark has a unique position of strength in the form of the established tripartite collaboration between industry, government authorities and research¹⁹. This collaboration provides a strategic platform for promoting innovation and sustainability in pig production. Especially within technology development, feeding strategies and reduction of greenhouse gas emissions, the tripartite partnership offers significant opportunities:

¹⁹ Mernild, M. (2023). Producing more with less: Transforming global food systems for a more sustainable and resilient future. Version 1.0 December 2023
https://issuu.com/stateofgreen/docs/sog_whitepaper_producingmorewithless2023_210x297_v?fr=sM-DJiMzY4NTc5MzI&submissionGuid=a22a7437-3a6f-4777-b1ed-f8737e539684

- **Technological innovation and implementation**

Tripartite co-operation enables faster translation of research-based knowledge into practical solutions. Through joint development projects and targeted support schemes, new technologies - such as advanced ventilation systems, sensors for climate control, and precision fertiliser systems - can be widely deployed in the sector. Public funding combined with industry investment reduces the financial barrier for farmers, while technologies can be standardised and proven for export markets.

- **Feeding strategies with a lower carbon footprint**

Feeding is a significant part of the carbon footprint of pig production. The tripartite can coordinate efforts between the feed industry, research institutions and farmers to develop feed mixes with lower methane and ammonia emissions, for example using additives, fermentable fibres or protein optimisation. At the same time, support of the development of feed with lower import dependency and lower environmental impact, such as locally grown alternatives to soya can further reduce the climate impact from feed.

- **Reducing greenhouse gas emissions**

Methane and nitrous oxide from slurry and housing are key sources of the climate impact of pig production. Tripartite co-operation can support large-scale implementation of solutions such as:

- Frequent slurry spreading and slurry cooling
- Biogas plants with joint collection
- Climate-neutral housing technology and energy management

By combining incentive schemes, documentation requirements and practical advice, higher impact and wider adoption can be ensured.

- **Data, documentation and export potential**

Tripartite collaboration can strengthen the development of standardised metrics and ESG reporting that document sustainable performance to authorities, investors and export markets. This creates transparency and the opportunity to differentiate Danish pork as climate-friendly, which in turn supports sales both nationally and internationally. However, there is a crucial need for retail to support climate smart pig production by increasing the trust and willingness to add the products into market and hereby giving the consumers a chance to be aware of the products. Alongside communication and awareness campaigns promoting the products is needed to support the transition in the entire value chain of pig production.

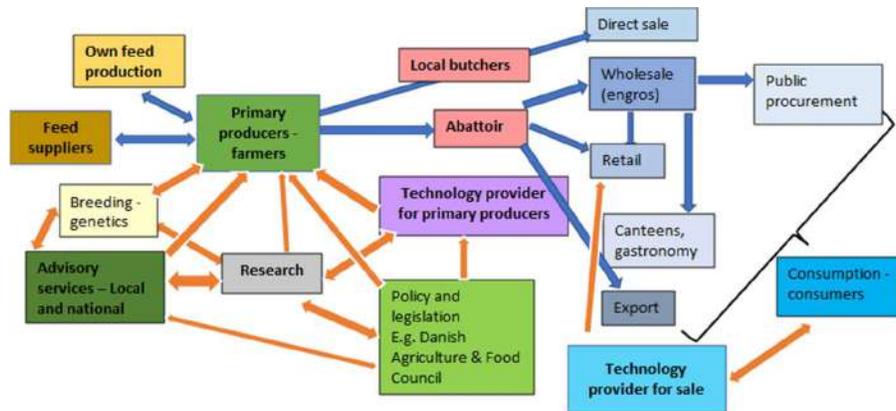


Figure 4. Value chain components in the Danish pig farming Use Case

2.5.2 CCW agenda

The 3rd CCW of the EU project BEATLES <https://beatles-project.eu/> took place on the 7th March 2025 at Skov A/S with 11 participants. The CCW focused on the green transition and fair business models in the pig sector with emphasis on energy savings and efficient livestock production.

The CCW agenda was as follows:

- Round table and introduction by Use Case lead (FBCD)
- Presentation of brief overview of the results of the BEATLES project including the Use Case focus areas for discussion at the workshop, including energy optimization, acidification, frequent manure removal, biogas supply, horse/faba beans as feed alternative.
- Presentation by guest speaker 1: Energy optimisation by Paul Pedersen (SKOV A/S)
- Session 1: Validation of fair business models for implementing climate-smart agricultural practices in the pig sector.
- Presentation by guest speaker 2: ESG accounting with focus on the E in scope 3 by Michael Thing Knudsen (SKOV A/S)
- Session 2: Identifying relevant sustainability parameters in pig production
- Wrap-up and take-home messages
- Networking and tour at SKOV A/S

2.5.3 Workshop presentations

Presentation by Poul Pedersen (SKOV) on Energy Optimization Energy-efficient ventilation as a lever for sustainable pig production - SKOV's contribution

As a key player in the development of technologies for pig production, the presenter from SKOV, with 13 years of experience from both the company and SEGES, has a unique insight into how the climate impact from production can be reduced. With the company's strong international position and deep roots in the Danish model, SKOV plays a key role in the realization of green transition - especially under the auspices of the Danish tripartite cooperation.

In Denmark, the total climate footprint is distributed as follows:

- About 2/3 is due to feed production
- 22% from methane in manure
- 3-5% from methane in digestion
- 2-3% from nitrous oxide

- 4% from energy consumption

While technologies that can effectively filter methane and nitrous oxide are not yet available, energy consumption is an area where both technology and practice can quickly make a difference .

SKOV works systematically with:

- Aerodynamic design and optimized fan blades
- Efficient PM motors
- Speed regulation
- Dynamic step controls
- Low-noise and precise airflow

These solutions are tested in the company's own energy laboratory and have proven to be effective in countries such as the Philippines, where energy prices are up to 5 times higher than in Denmark. Here, energy savings can not only provide climate benefits, but also release funds for further sustainable initiatives such as feed optimization, housing improvements and biogas plants.

For the BEATLES project UC group and the entire Danish pig industry, it is crucial to understand how energy efficient ventilation can:

- Reduce climate impact quickly and measurably
- Improve animal welfare and productivity
- Create export opportunities for Danish technology
- Support ESG²⁰ reporting and documentation

Through Danish tripartite collaboration, such technologies can be scaled and implemented widely - which is important both for the sector's reputation and for Denmark's position in the global climate and energy transition.

Presentation by Michael Thing Knudsen on SKOV ESG Reporting

In 2023, SKOV initiated its Environmental, Social, and Governance (ESG) reporting in alignment with increasing regulatory demands and sustainability goals. A key focus is the reporting of emissions under Scope 3.11, which is greenhouse gas emissions from products sold. This step is crucial for pig producers, as it directly impacts both compliance and long-term operational sustainability.

SKOV's ESG reporting highlights several core areas tied to energy consumption in pig production facilities, particularly those involving:

- Ventilation systems
- Heating units
- Cooling pumps
- Climate controllers

From the collected data, sourced from over 13,000 climate controllers and more than 204 million individual datasets, it was found that ventilation systems account for 78% of total emissions. This insight emphasizes the need for energy-efficient ventilation solutions, especially as they represent the most significant contributor to carbon footprints in pig housing environments. Furthermore, there are regional differences in energy efficiency, with facilities in Asia emitting significantly more CO₂ due to lower efficiency standards or

²⁰ Environmental, social and corporate governance reporting

technologies. One of the main challenges SKOV faces is the lack of market-driven demand for green technologies. Without strong incentives or regulatory pressure, customers may deprioritize sustainability in favor of short-term costs. Additionally, while ESG reporting adds strategic value and transparency, there is concern it might shift focus away from practical CO₂ reduction in day-to-day pig farming operations.

For the stakeholder group in pig production, SKOV's ESG data provides insights that can support:

- **Regulatory readiness:** The EU's 2026 deadline for ESG reference data means producers must begin adapting now.
- **Operational benchmarking:** Understanding emission contributions from climate systems allows farms to identify areas for energy optimization.
- **Technology investment:** There is a clear business case for adopting more efficient ventilation and climate systems, which can reduce emissions and operating costs simultaneously.
- **Sustainability branding:** Producers who align with ESG goals may gain a competitive advantage with environmentally conscious consumers and partners.

SKOV's ESG reporting initiative is not only a compliance measure but a valuable strategic tool for the pig production industry. With ventilation systems identified as the dominant source of emissions, it is imperative for the sector to invest in smarter, more efficient technologies. Stakeholders must act proactively, as the timeline for adaptation is narrowing and the potential environmental and financial benefits are considerable.

Next Steps for SKOV and pig production:

- Further testing of Dynamic Multi-Step Ventilation systems
- Exploration of risk-sharing models for climate-friendly feed production
- Continuing ESG data collection and refinement

A guided tour took place as part of the Workshop at SKOV, showcasing their products, solution and R&D department.

2.5.4 Key messages arising

From the workshop in general, the following key takeaways were highlighted and agreed upon by the group and hence considered crucial factors for performing a successful green transition of the pig sector:

- **Energy-efficient ventilation** plays a crucial role in sustainable pig production
- **Regional differences** in climate and energy pricing impact global pig farming strategies
- **Retail and consumer demand** are essential for scaling sustainable solutions
- **ESG reporting** is valuable but must align with actionable sustainability goals

Specific Questions Addressed

- **Environmental regulations in Denmark:** Is energy efficiency a key factor?
- **Cooling strategies:** How does SKOV approach cooling solutions in different climates?

- **Business model considerations:** If food companies (e.g., Arla) adjust pricing for sustainability, could this model be applied to pig farming?

Climate-friendly pig farm construction

- Challenges in meeting climate impact requirements without increasing overall emissions
- Need for consideration of the building's purpose

Risk-sharing fund

- Example: Horse bean cultivation risk supported by public/private stakeholders
- Farmers are willing to share data, but retailer participation is crucial
- Consumer demand is uncertain post-COVID

Retail decisions for climate-smart agriculture

- Need for realistic, gradual requirements for regenerative agriculture
- Consumers confused about sustainability and meat consumption

Focus on energy efficiency in ventilation

One of the key discussions at the workshop centred on the **need for energy-efficient ventilation** systems in sustainable pig production. Stakeholders - including farmers, technology experts and researchers - agreed that ventilation is not just about animal welfare but plays a direct role in both energy consumption and emissions.

How and why energy-efficient ventilation is important:

- **Energy optimization:** Traditional ventilation systems account for a large part of the total energy consumption on a pig farm. New, automated systems with low-energy fans and demand-controlled regulation can reduce consumption by up to 30-40% according to figures presented by the Danish Technological Institute.
- **Emissions and environmental impact:** Ventilation also has an impact on ammonia emissions and storage temperature, which in turn affects odour and manure management. It was discussed whether it is primarily energy consumption or emissions that are most critical - and the conclusion was that a balanced approach is needed to truly achieve sustainability.
- **Economic benefit:** Cases were also presented where investments in energy-efficient systems were repaid in less than five years due to energy savings and improved production environment.
- **Link to LCA and sustainability indicators:** Ventilation strategies were highlighted as a key parameter in the life cycle assessments (LCA) that will later form the basis for certification and documentation of sustainability in agricultural production.

Energy-efficient ventilation is not just a technical aspect - it is a cross-cutting factor that links economy, climate, animal welfare and social acceptance of modern livestock production. To ensure sustainability, technologies must therefore be implemented as part of an overall strategy that also includes feeding, housing environment and manure management.

During the workshop, ventilation was discussed in several contexts, not just as a technical installation, but as an integral part of a sustainable production system. In particular, the discussions highlighted the following:

- **energy and operating economy**

Ventilation accounts for 20-40% of the total electricity consumption in a pig house. It was discussed how modern systems with frequency-controlled motors, heat recovery and sensors that adapt air change according to animal density and climate can significantly reduce this consumption. Several participants mentioned experiences of energy savings of up to 50% compared to older systems.

- **indoor climate and animal welfare**

Ventilation is crucial for air quality, temperature control and moisture levels, which directly affects pig welfare. A poor indoor climate can increase disease incidence and medication consumption - which in turn negatively affects sustainability. Several participants pointed out that proper ventilation reduces stress and improves growth rate in pigs, which has both ethical and economic implications.

- **emissions and climate impact**

A large part of ammonia emissions from pig production comes from the barn. Ventilation strategies that reduce temperature variations and improve manure management can help reduce these emissions. It was highlighted that emissions depend not only on feed composition and manure system, but also on how and how quickly odors and gases are released.

- **Life cycle assessment (LCA) and documentation**

A key discussion centred on how the contribution of ventilation to the overall environmental impact should be documented in LCA models. Several stakeholders called for standardized methods to include energy consumption and emissions in environmental declarations (e.g. EPDs), which is necessary for credible sustainability certification.

- **Barriers and incentives**

The workshop also identified barriers: high investment costs, lack of knowledge about the performance of systems, and the need for technical advice. On the other hand, possible incentives such as energy subsidies, green financing and consumer labelling were pointed out to make investing in energy-efficient solutions attractive.

The discussion clearly showed that energy-efficient ventilation is not just an environmental measure, but a key element in a holistic approach to sustainable pig production. It is necessary to consider ventilation together with feeding, house design and economic framework - and support it with data and documentation to create a robust and responsible production model.

Regional differences were also highlighted as a key finding. In climate and energy prices affect global pig production strategies. The workshop highlighted how pig producers in different countries and regions face vastly different conditions when it comes to energy consumption and environmental impact. In Scandinavia, high energy prices and cold winters play a significant role in the choice of ventilation and heating strategies. In southern Europe and tropical regions, cooling and heat dissipation are more important. These differences mean that technological solutions and sustainability goals cannot be standardized globally - but must be adapted locally. This also has implications for benchmarking in international ESG reports and LCA calculations.

'Retail and consumer demands are crucial for scaling up sustainable solutions' was discussed by several stakeholders emphasizing that even the most effective technological solutions will have a limited impact if demand from the retail sector and consumers do not drive implementation. Retail chains in particular play a strategic role as intermediaries between production and market and can demand proven sustainability. A case study from

Germany showed how labelling schemes and bonus models for 'climate-friendly pork' created incentives for farmers. The discussion therefore highlighted the need for transparency and standards to give consumers real choice.

ESG reporting has value but must be linked to concrete and measurable sustainability goals.

There was consensus that ESG (Environmental, Social, Governance) reporting is an important tool to document and communicate sustainability efforts. However, several participants warned against the superficial use of ESG as 'greenwashing' if reporting is not tied to measurable, operational goals. It was suggested that ESG data should be integrated into decision-making tools for both investors and farmers, and be directly linked to e.g. LCA results, resource consumption, animal welfare and labour conditions.

2.6 Use Case The Netherlands value chain onion and potato

2.6.1. Use Case Profile

The Dutch Use Case is about the value chain for climate-smart production of onions and table potatoes under the "On the way to PlanetProof" label (PP). The two value chains are different in the sense that onion production in the Netherlands is to a large extent for export outside Europe, e.g. in 2024, 35-40% to African countries including e.g. Senegal and Ivory Coast. Outside Europe, sustainability requirements are less or even absent. Table potatoes are for a larger part meant for the Dutch market, product buyers do require more and more CSA produce. This makes the chains different in terms of sustainability. Many farmers have onion and potato in their crop rotation, so the difference between the value chains is for the part that comes after the growers. Product storage takes place on the farm, until product delivery. Both products can be stored from September to May, with delivery during the whole period. Table potatoes are mostly grown on a contract with a product buyer. On the other hand, farmers sell onions to any buyer offering the highest price. The 'On the way to PlanetProof' certification scheme has requirements for the following topics: Energy and climate, crop protection, biodiversity, soil quality and fertilisation, water, material for packaging and waste streams. For more detailed information about the certification scheme see <https://www.planetproof.eu/en/>. The Use Case is further depicted in Figure 5 below.

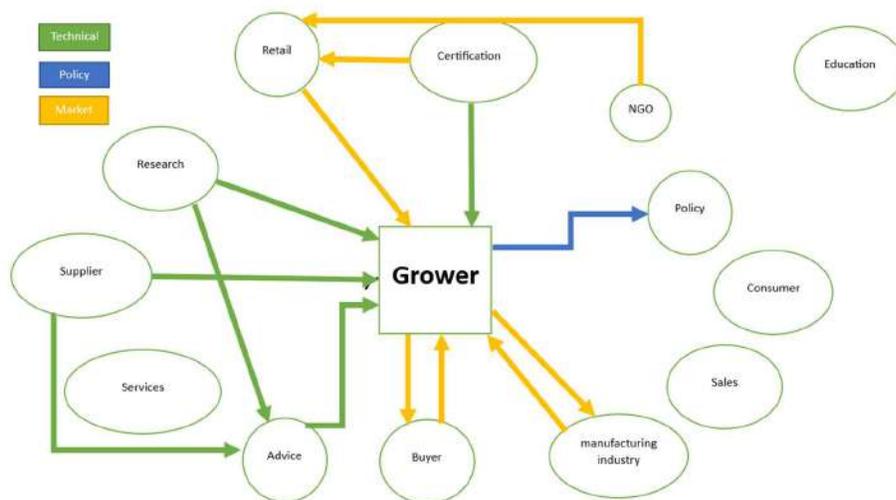


Figure 5. Influence and/or impact on stakeholders in the Netherlands onion and potato Use Case value chain

In 2022, the Netherlands produced approximately 6.9 million tonnes of potatoes, with an average gross yield of around 42.6 tonnes per hectare. Potato cultivation covered roughly 160,000 hectares, accounting for nearly 30% of the country’s total arable land. The Dutch potato harvest serves multiple purposes: about 50% is destined for direct consumption as table potatoes, 25% is used as seed potatoes, and the remaining 25% is processed into products such as starch and French fries. The sector is also highly export oriented. During the 2021/2022 season, the Netherlands exported around €3 billion worth of potatoes and potato products, with approximately 70% of table potatoes being shipped to international markets. As of 2023, there were over 11,000 arable farms active in the Netherlands, many of which contribute to the country’s strong position in global potato production and trade.

The focus of this CCW was on the potato chain. In this chain, steps are being taken to make the chain more sustainable. Opportunities around mechanical weed control and more robust varieties against the potato blight mold *Phytophthora infestans*.

Weed control in potato cultivation is facing major changes. As of 2026, the products Sencor (active substance: metribuzin) and Gofor (active substances: clomazone and metribuzin) will no longer be authorized. This demands new strategies in crop management.

Mechanical weed control techniques are developing rapidly. Innovations such as Ecorobotix precision spraying systems and advanced hoeing robots show that technical alternatives to chemical weed control are becoming more viable.

However, mechanical weed control comes with its own challenges. Soil type, climate conditions, field preparation, and the availability of labour are all critical factors. For instance, heavy clay soils and wet weather conditions make mechanical weeding significantly more difficult.

Finding the right balance between chemical and mechanical weed control is key. Chemical control is cheaper, but it leads to higher environmental impact points. Mechanical control reduces environmental impact but requires more investment in equipment and labour.

If farmers are expected to shift more toward mechanical weed control, who will bear the additional costs? Unfortunately, supermarkets were not present at this workshop. Yet they

are an essential link in the chain to help answer this question and work with farmers on sustainable solutions.

2.6.2 CCW Agenda

The 3rd CCW in the Netherlands was held on the 12th of March 2025 with 18 participants. The Use Case leads decided to focus mainly on the potato value chain during this CCW. The motivation for this is that steps are currently being taken to make the potato value chain more sustainable. There are opportunities for mechanical weed control and more robust varieties against the potato blight mold *Phytophthora infestans*.

The agenda of the CCW was as follows:

- Introduction and presentation of objectives and expectations of the workshop by the UC leads.
- Presentation of brief overview of the results of the BEATLES project.
- Presentation by guest speakers on mechanical weed control, John Jansen (SMK) & Jeroen Willemse (Delphy). Specific emphasis was on the use of robust potato varieties for reducing fungicide use against potato blight mold (*Phytophthora infestans*).
- Session 1: Validation of the fair business model and evaluation of fairness framework
- Session 2: Identifying relevant sustainability parameters in the onion and potato use case value chain: introduction to the sustainability framework, presentation of Selected Key Impact Indicators, weighting of the Sustainability Framework Parameters
- Participant feedback survey

The participants in the Netherlands CCW found the sessions productive but observed that a lot of information was requested from them during the validation exercises. They reported that the use of Mentimeter helped keep the session interactive, providing immediate results and facilitating discussion. Participants emphasized the need to focus on who should bear the cost of fairness within the supply chain.

2.6.3. Workshop presentation

A key insight from this presentation made by the guest speakers is that the robust potato varieties offer natural resistance and improved yield security. In the Netherlands, this is being tested through demonstration fields at three locations, where 29 varieties (both resistant and susceptible controls) are evaluated. The approach includes delaying the first fungicide application, based on decision-support systems and close monitoring of disease development and spore dynamics. These activities are part of the Public-Private Partnership (PPP) on Resistance Management of *Phytophthora infestans*, led by BO Akkerbouw with partners including WUR, Bionext, and SMK. For successful adoption, broad value chain involvement and attention to other agronomic traits—such as taste, storability, and yield potential—are essential. This approach aligns closely with the goals of the BEATLES project, which aims to drive systemic change towards more sustainable, integrated farming practices. The adoption of robust varieties fits within BEATLES' vision of reducing chemical inputs, increasing system resilience, and promoting innovation through collaboration and shared knowledge across the agricultural value chain.

3 WP3 session: Environmental, economic and social sustainability framework

3.1. Objectives of the session

The objective of this session was to validate the framework provided by WP3 including parameters covering environmental, economic and social sustainability according to standard LCA practices.

3.2 Overview of the session

The three components of this session were as follows:

1. Introduction to the Sustainability Framework

Introducing the WP3 sustainability framework, explaining its role in comparing and improving agricultural practices.

2. Selected Key Impact Indicators

Presentation of the main environmental, economic and social impact indicators.

3. Survey to Weight the Sustainability Framework Parameters

A survey was carried out asking the participants to weight the sustainability framework parameters according to their perceived relative importance. Results were sorted according to the type of actor. The survey was done using Mentimeter.

The sustainability framework was presented for each Use Case to validate. As an example, here is the framework for the Danish pig farming Use Case. This provided a brief overview of the key indicators to help guide the workshop discussion. Following the presentation of the parameters specific to each Use Case, a survey with questions was conducted .

Environmental indicators

- **Global Warming Potential (GWP)** measures how gas emissions contribute to climate change and temperature increase, affecting weather patterns and farming conditions.
- **Terrestrial acidification** happens when harmful chemicals, like sulphur and nitrogen, make the soil more acidic, which can hurt plants and crops.
- **Freshwater eutrophication** happens when too many nutrients, like nitrogen or phosphorus from fertilizers, can over-enrich freshwater systems, causing algae blooms that can harm water quality and fish.
- **Water consumption** measures the amount of freshwater used and not returned to its original source, which can affect water availability for irrigation, ecosystems, and other users.
- **Fossil depletion** refers to the use of non-renewable fossil fuels, like diesel or natural gas, which reduces their availability for future generations.
- **Ozone formation** occurs when pollutants mix with sunlight, creating harmful ozone that can damage crops and degrade air quality.

Economic indicators

- **Number of pigs for slaughter per year:** The total count of pigs a farm raises and sells for meat within a year.

- **Subsidy dependency:** Reliance on government financial support to help cover the cost of farming.
- **Revenues:** Total amount of money a farm earns from the sale of its products.
- **Net profit:** The amount of money a farm actually earns after covering all costs.
- **OpEx:** The ongoing costs of running a business, like paying for labor, equipment, or supplies.
- **CapEx:** The money spent on buying or upgrading long-term assets, like equipment or buildings.

Social indicators

- **Fair Income:** A reasonable amount of money paid for the work done, based on the job and the market value.
- **Health Expenditures:** They reflect the status of the health system, as well as the farm's commitment to ensuring the well-being and care of its workers and associates.
- **Safety Measures:** The actions or money spent to protect workers and prevent accidents on the farm or in other workplaces.
- **Education Expenditures:** Amount of money that is spent by the farm, government, or agricultural organizations on training and teaching farmers new skills and farming practices.
- **Gender Wage Gap:** The difference in salaries between male and female workers for doing the same or similar work. Its reduction promotes gender equality, ensuring fair compensation for all workers.
- **Promoting social responsibility:** Participation in initiatives or organizations that encourage farms to support local communities, adopt sustainable climate smart agricultural practices, and demonstrate a commitment to ethical and environmentally responsible farming.

3.3 Outcomes of the session

The following are summaries of the sustainability framework validation sessions generated by WP3.

3.3.1 Use Case Lithuania - value chain wheat farming

Balancing the three pillars of sustainability

A closer look at the results from the workshop reveal that environmental sustainability received the widest range of scores, from 20% to 40%, with most responses falling between 30–35%. Economic sustainability attracted slightly more attention, with ratings ranging from 30% to 50% and most values clustering between 30–40%. The social dimension was the most consistently rated, with a narrow range of 30–35%. In conclusion, although the differences are not extreme, the economic aspect tends to be prioritized slightly higher by stakeholders. This suggests a recognition of economic viability as a foundation for sustainable practices, even when social and environmental values remain closely aligned in perceived importance. More specifically, farmers clearly prioritized the financial viability and productivity of agricultural practices, as evidenced by their highest emphasis on the economic pillar (40%). This aligns with their responsibility for overseeing activities and means of subsistence that are extremely susceptible to cost structures, subsidies, and profitability. The social pillar came in second (31%), perhaps as a result of factors like long-term generational sustainability, rural community welfare, and working conditions. Although it is still significant, the environmental dimension was given a lower average weighting of 29%, indicating that it might be viewed as secondary to immediate operational concerns. With social and environmental factors receiving 32.5% and economic

factors only marginally higher at 35%, policy makers showed the most equitable distribution. Their larger mandate to guarantee sustainable development in the social, economic, and environmental spheres was probably reflected in this balance. Additionally, consumers showed an even distribution, giving economic and environmental concerns equal weights of 35% each, while social issues received a slightly lower but still significant 30% weight. This suggests that while consumers value affordability and market accessibility, they are also aware of the environmental effects of food systems (such as carbon footprints or resource use). The less emphasis on social factors may be a result of a lack of awareness about topics like supply chain impacts on communities or labour rights.

Environmental indicators

The three most important environmental indicators identified by stakeholders were **land use**, **ecotoxicity**, and **global warming**. These choices demonstrate a strong awareness of both immediate and long-term environmental impacts—ranging from the local consequences of land degradation and chemical use to the broader challenge of climate change. Each stakeholder groups' weighting of the environmental indicators reflected their distinct viewpoints and concerns. All stakeholder groups gave **global warming** a moderate rate of importance. Customers gave it the highest rating (3.3), most likely as a result of media coverage and general public awareness. It received slightly less weight from farmers (2.4) and policy makers/advisors (2.2), presumably because they were more concerned about more immediate or locally tangible impacts. All groups provided a moderate score, indicating that although climate change was recognized, it did not take precedence over other environmental concerns in this situation. Farmers rated at 3.2 **terrestrial acidification**, which may be a reflection of their worries about the productivity and quality of the soil. It may not have been a primary factor in their sustainability frameworks, as consumers (2.7) and policy makers/advisors (2.2) placed somewhat less emphasis on it. All stakeholders, including farmers (2.2), consumers (1.0), and policy makers/advisors (1.4), consistently gave **freshwater eutrophication** low importance. This points to a general lack of prioritization, which may have resulted from a lack of awareness or comprehension of the effects of nutrient runoff or from the belief that it was less urgent than other environmental issues. Policy makers gave **land use** the highest rating (3.6), followed by farmers (2.8) and consumers (2.7). According to the consensus, land degradation, biodiversity issues, and spatial efficiency were all well-known problems. The constant moderate-to-high weighting of this indicator suggests that it was regarded as essential to sustainable farming methods. Consumers gave **water consumption** a slightly higher weight (2.7), but policy makers and farmers gave it the lowest ratings (1.8 and 2.0). This might be a result of varying exposure to the risks of water scarcity—consumers might think that agriculture uses a lot of water, whereas practitioners might feel more in control of irrigation techniques or see fewer problems locally. Moreover, farmers and policy makers gave **fossil fuel depletion** low-to-moderate importance (2.4 and 2.0, respectively), whereas consumers did not even rate this. Farmers gave **ozone formation** a slightly higher rating (2.0), while consumers and policy makers/advisors gave it very low ratings (1.0 each). This points to a general belief that it was a less important problem for agricultural sustainability. Last but not least, across all groups, **ecotoxicity** was one of the most significant indicators: consumers (3.0), policy makers/advisors (3.6), and farmers (3.8). The high scores point to a common concern regarding the effects of fertilizers, pesticides, and other chemicals on the environment and potentially human health. Among all stakeholder categories, it was one of the few indicators that showed strong alignment.

Economic indicators

On the economic side, the top indicators selected were net profit, crop yield (by weight), and capital expenditures (CapEx). This prioritization suggests a strong focus on financial viability and productivity. However, it also raises a critical tension— one stakeholder (a

policy advisor), acknowledged that increased yield often comes at the expense of environmental sustainability, highlighting the trade-offs that can occur in practice.

Production yield received a rating of 3.6 from both farmers and policy makers/advisors, suggesting that they both believe it is crucial to agricultural performance. Customers, on the other hand, gave it a lower priority (2.3), which probably reflects how disconnected they are from the production process. Those who are directly involved in or in charge of farming operations seem to view this indicator mainly as a technical issue. With averages ranging from 2.4 (farmers) to 2.8 (policy makers), **subsidy dependence** was rated as low to moderately important by all groups. The moderate scores might suggest that subsidies are acknowledged as a means of assistance rather than as a key component of sustainability or profitability. Additionally, consumers rated it similarly important (2.7), indicating that it is a general concern. Farmers, who rely heavily on sales for their livelihoods, gave **revenues** generation the highest rating (2.8). It was given a significantly lower priority by policymakers (1.8) and consumers (1.3), which may reflect a preference for more general economic metrics (like net profit) or final consumer costs over gross revenue numbers. Across all stakeholder groups, **net profit** was unquestionably regarded as the most significant economic indicator: farmers and policy makers/advisors gave it a score of 4.8, while consumers gave it a perfect 5. All groups gave OpEx a moderate amount of importance; farmers scored 2.4, while consumers scored 3.0. This suggests that stakeholders understood the importance of daily operating expenses, especially when it came to maintaining long-term viability and efficiency. It was not given the same priority as net profit, though. With average scores ranging from 2.6 to 3.0 for all groups, CapEx was likewise regarded as having a moderate level of importance. This implies that although capital expenditures for equipment or infrastructure are important, they are not seen as urgent or primary issues in comparison to operational expenses or profitability.

Social indicators

For the social dimension, stakeholders emphasized fair salaries, worker safety, and the promotion of social responsibility as the most important indicators. Among all stakeholder groups, the most highly regarded social indicator was a **fair income**. It received almost unanimously high marks from farmers (4.8) and policymakers/advisors (5), highlighting the importance of income equity for the social sustainability of the industry. Although consumers gave it a slightly lower rating (3.3), they still recognized its significance. In contrast, all stakeholders viewed **health expenditures** as comparatively less significant. It received a moderate rating from farmers (3.0), but a low rating from consumers (1.7) and policy makers (1.8). This may be a reflection of the belief that health-related expenses are either less urgent than income or safety concerns, or that they are not directly within the purview of agricultural systems. Consumers (4.7) and farmers (4.4) gave **safety measures** high ratings, demonstrating a strong concern for safe working conditions and procedures. It received a lower rating (2.4) from policymakers and advisors, presumably assuming that current regulations sufficiently address this. Nonetheless, the data indicates that people who are more directly involved in agricultural activities (farmers and consumers) place a high value on workplace safety. Farmers (3.6) placed a higher value on **education expenditures** than did consumers (2.3) and policymakers (2.6), indicating that they received moderate attention. Farmers' higher ratings might be a reflection of their understanding of the long-term advantages of education for community development and farm management. Other groups' lower ratings imply that it is not considered a major sustainability concern. In general, consumers (2.3) and policymakers (1.8) gave the **gender wage gap** a low rating. Additionally, farmers gave it a comparatively lower importance rating of 2.2. Nevertheless, the fact that responses (1-5) varied widely suggests that people have different perspectives, possibly due to different levels of awareness or local experiences with gender pay gaps. This implies that gender equity needs to be more clearly

integrated into sustainability discussions and given more attention. All groups rated the importance of **promoting social responsibility** as moderate, with consumers (3) coming in slightly behind farmers and policy makers/advisors (3.4).

In conclusion, while all three pillars of sustainability are clearly valued, the results reveal a nuanced reality: economic goals—particularly profit and productivity—tend to take precedence, even when there's recognition that this may compromise environmental integrity. This underlines the need for more integrated strategies that balance economic performance with long-term environmental and social resilience.

Comments by the stakeholders on gender wage gaps:

- There was a discussion on gender equality in wages. One stakeholder (policy advisor) suggested that while equality may exist in theory, there are few, if any, practical examples. Others disagreed (policy advisor, consumer), saying they had encountered such examples, but noted that people may be hesitant to speak up, and there is often no concrete proof. Since wages are typically not public information, it's difficult to compare salaries. If wage data were openly accessible, it might cause dissatisfaction due to visible discrepancies. In addition, added by policy advisor, women are keener to accept the income they are getting, while men approach the subject more aggressively, which gets them higher salaries.
- The topic also touched on gender equality in leadership boards. Policy advisor noted, that in male- or female-dominated sectors and institutions, a 50/50 gender split is not always realistic, even though some argue that this should be the goal. Policy advisor and consumer pointed out that men still dominate in top leadership positions — for example, in the government, there are more male than female ministers. Policy advisor argued that in Ministry of Agriculture of Lithuania, 75% of employees are women, but consumer added, that their roles are mostly lower-ranking and not at the government level.
- In some sectors like polyclinics, women dominate even in higher positions. Similarly, schools tend to employ more women, although efforts could be made to encourage more men to enter the profession. Certain jobs — such as milkers, seamstresses, and accountants — still carry gender stereotypes as “women’s work,” which may explain the lower number of men in these roles. (Pointed out by policy advisors and consumer agreed)

3.3.2 Use Case The Netherlands – value chain onion and potato farming

Balancing the three sustainability pillars

With an average weight of 50%, environmental factors were given the highest weighting, suggesting that stakeholders view environmental sustainability as the most important factor in the context under consideration. With 35%, economic factors come next, indicating a strong but secondary concern for financial viability and performance. With the lowest ranking of 15%, social considerations appear to be less important or urgent than the other two pillars. This distribution highlights a strong emphasis on environmental sustainability, possibly reflecting the current sectoral and global emphasis on reducing environmental footprints, mitigating climate change, and maintaining long-term ecological balance. The significant weighting given to economic factors also implies that financially viable solutions are acknowledged. The social dimension's relatively low valuation, however, can indicate that it is not given enough weight in stakeholder assessments or that people believe social impacts are less obvious or measurable. This result emphasizes how crucial it is to make sure that all three pillars—especially the social dimension, which runs the risk of being disregarded despite playing a crucial part in attaining holistic and equitable sustainability—are sufficiently taken into account in future sustainability frameworks.

Environmental indicators

According to the average stakeholder responses, there are varied perspectives on the **environmental indicators**, with some issues being given more importance than others. For instance, **freshwater ecotoxicity** (3.5) and **carcinogenic human toxicity** (4.0) were rated as the two most concerning environmental indicators out of the eight that were examined. This suggests that pollution and its direct effects on aquatic ecosystems and human health are strongly viewed as risks. Both **non-carcinogenic human toxicity** (3.1) and **terrestrial ecotoxicity** (3.3) received comparatively high scores, highlighting the importance stakeholders place on toxicological risks, whether they impact human populations or terrestrial systems. According to these findings, harmful emissions and the consequences they cause are regarded as serious environmental hazards. Moderate concern was expressed for other environmental indicators like **terrestrial acidification** (2.7), **freshwater eutrophication** (2.9), and **global warming** (3.1). The somewhat lower ratings for eutrophication and acidification might be due to the belief that their effects are more controlled or managed, or that they are more localized or less obvious, even though climate change (global warming) is still a major concern. With the lowest rating of 1.7, **water consumption** is thought to be the least important of the evaluated indicators for this specific UC, as it is located in a productive delta as mentioned during the CCW and does not face water scarcity.

Economic indicators

During the evaluation of the **economic indicators**, the highest average ratings were given to **net profit** (4.7) and **revenues** (4.2), suggesting that stakeholders give the most weight to overall economic returns. This implies a strong emphasis on market success and profitability as the main economic drivers of sustainability. Another significant metric that highlights the importance of output efficiency is **production yield** (3.5). Although yield is not as highly regarded as revenue or profit, it is still thought to be a vital component of economic sustainability. On the other hand, **OpEx** (2.9) and **CapEx** (3.1), were given less attention. **Subsidy dependence** received the lowest rating (1.5), confirming the general perception that depending on outside funding is not a desirable or sustainable state of the economy. This low score could mean that stakeholders prefer market-based viability and self-sufficiency, or it could mean that they think relying too much on subsidies compromises the resilience or credibility of economic performance.

Social indicators

Within the **social dimension** of sustainability, stakeholders place a high value on fundamental labor rights and working conditions, as evidenced by the high average scores for both **fair income** (4.8) and **safety measures** (4.5). These findings imply that there is broad agreement that upholding safe working conditions and providing fair compensation are essential components of socially conscious behavior.

3.3.3 Use Case Spain – value chain organic apple farming

Balancing the three pillars of sustainability

The survey results show that farmers place the greatest emphasis on the economic pillar (41.3%), followed by the social (31.2%) and environmental (27.5%) pillars. This prioritization reflects the fact that achieving social or environmental goals on the farm frequently requires economic viability. Even though economic issues are still the most pressing, many farmers understand the value of a balanced approach, as evidenced by the comparatively narrow gap between the pillars and the range of responses (economic: 25-50%; social: 25-50%).

The environmental pillar received 50% of the advisor's weight, while the economic and social pillars received equal weights of 25%. This probably indicates a focus on environmental preservation and long-term sustainability, which is in line with the advisory

function in directing systemic changes. However, the fixed allocation may also indicate that it is difficult to distinguish between goals that are equally important.

Farmers' organizations typically take a more balanced approach, allocating 30% to the economic and social pillars and 40% to the environment. Their strategic positioning across various sustainability domains and broader perspective are reflected in this. A balanced viewpoint is both essential and strategic because these organizations frequently serve as a liaison between practice and policy.

The consumer gave each of the three pillars almost equal weights (33.3%-33.4%), confirming the notion that lay stakeholders frequently see sustainability as a cohesive whole rather than as distinct categories. This bolsters the more general criticism that giving one pillar more weight than another might not accurately represent how consumers conceptualize sustainability.

Environmental indicators

All stakeholder groups consistently gave **global warming** high importance scores; averages ranged from 4 (farmers, farmers' organizations, and consumers) to 5 (advisors). This alignment demonstrates how widely acknowledged climate change is as a major environmental issue. Despite their varying roles in the agri-food chain, all stakeholders consider global warming to be of high importance.

Terrestrial acidification ratings were highly variable. Farmers' organizations gave it a slightly higher rating (3), while the advisor and consumer gave it a moderate importance (scores of 2 and 3, respectively). The individual farmers gave it a lower rating (avg. 1.5, with a wide range of 1-5).

While consumers (5), advisors (4), and farmers' organizations (4.3) placed greater importance on **freshwater eutrophication**, farmers rated it relatively low (1.8). This disparity might indicate a misalignment between practical nutrient management techniques and more general public or advisory worries about deteriorating water quality.

The advisor (5) and farmers (4.8) gave **land use** consistently high scores, indicating that it is considered a tangible and important component of environmental sustainability. While advisors and environmental organizations probably consider land use efficiency in terms of habitat conservation and long-term ecological balance, farmers associate it with productivity.

Although there was some variation, the majority of stakeholders considered **water consumption** to be significant. The consumer gave it a lower score (2), perhaps as a result of less direct visibility of agricultural water use, whereas farmers (4) and farmers' organizations (4) stressed its significance. Additionally, the advisor's mid-range score (3) indicates a moderate but acknowledged relevance.

With farmers averaging 1.8 and farmers' organizations 3.3, **fossil fuel depletion** received comparatively little to moderate attention. Energy dependence is a critical issue, according to the advisor, who gave it a high score of (5). The disparity in answers suggests different time horizons: short-term issues (soil, water) versus long-term, systemic sustainability hazards (dependency on fossil fuels).

With the exception of farmers' organizations (3.3), **ozone formation** was generally rated lower across the board (farmers: 1.8; consumers and advisors: 2-3). The low scores and broad range (2-5) indicate that stakeholders may not be well-versed in this particular impact, which supports the general feedback that certain categories were challenging to evaluate.

Ecotoxicity received the highest rating (5) from farmers' organizations, suggesting a high level of concern, perhaps as a result of its link to biodiversity and pesticide use. The advisor

gave it a high rating of (5), but farmers and consumers gave it lower ratings (farmers: avg. 2.3; consumers: 4). This variance may indicate varying degrees of exposure to or worry about chemical inputs and their negative effects on the environment.

Economic indicators

Most stakeholder groups gave **production yield** high ratings, especially farmers (4) and farmers' organizations (4.7), demonstrating its crucial role in evaluating agricultural performance. Although the advisor gave it a slightly lower score (2), consumers acknowledged its significance (4), perhaps reflecting a broader belief that yield by itself does not equate to sustainability or profitability. Given the variation between farmers (range 2–5), it is possible that the weighting of yield will vary based on the size, type, or market orientation of the farm.

With farmers giving it a low average score of 1.5 and consumers and farmers' organizations giving it moderate ratings of 3.7 and 3, respectively, **subsidy dependency** displayed the greatest disparity in importance. Additionally, advisors assigned a low-to-moderate score (2). Farmers' lower rating might be a result of their unwillingness to draw attention to their dependence or possibly their belief that they have no control over subsidies. On the other hand, organizations and advisors might view less reliance on subsidies as a sign of economic independence and resilience.

All groups gave **revenues** a moderate to high rating, with consumers (4), advisors (3), organizations (4), and farmers (3.5) all recognizing their significance. The comparatively small range of scores points to a widespread belief that gross income is still an important but not the only factor influencing financial health.

A key indicator of economic sustainability, **net profit** was consistently rated highly by all groups, but particularly by farmers (4), organizations (4.7), and consumers (5). Even the advisor gave it a comparatively high rating of (4).

Responses to **OpEx** were not entirely consistent. Advisors and organizations gave it higher ratings (4 and 4, respectively), while farmers gave it a relatively low rating (2.3). This could be a reflection of different perspectives on cost effectiveness versus output focus: advisors and organizations may be more sensitive to economic efficiency as a sustainability metric, whereas farmers may place a higher priority on productivity or income stability. Customers may have acknowledged the influence of cost on product prices, as evidenced by their moderate score of 3.

Like OpEx, **CapEx** was viewed as moderately significant, though stakeholder opinions varied. Advisors and organizations assigned it higher values (4 and 3.7), whereas farmers averaged 2.3. Customers gave it a moderate rating as well (3). This probably reflects CAPEX's long-term strategic role, which is seen as essential for innovation and infrastructure development by stakeholders with more expansive or policy-oriented viewpoints (such as advisors and organizations). If it isn't connected to any particular investment or support programs, farmers might not find it as immediately relevant.

Social indicators

All stakeholder groups consistently rated a fair income as important. With a wide range (2–5) and a strong average score of 4.3, farmers indicated that opinions and experiences regarding its urgency and current state varied. Farmers' organizations gave it a score of 5, while advisors and consumers gave it ratings of four or higher. This reflects a common concern for fair working conditions, especially for low-wage and seasonal agricultural workers.

Farmers rated **health expenditures** with a comparatively low average score (1.5), suggesting that it may not be viewed as a priority issue or as something that is directly

under their control. This indicator received more variable ratings, from 2 to 5. Advisors (5) and farmers' organizations (3.3 avg.) gave it a higher value, indicating that some stakeholders view occupational health risks and healthcare access as crucial issues. Customers rated it as moderate (3) as well. This variation could result from varying degrees of involvement or awareness regarding the working conditions on farms.

Every stakeholder acknowledged the significance of workplace **safety measures**; advisors rated at 4, farmers' organizations gave it an average of 3.7, and farmers gave it an average of 3.5, with a range of 2 to 5. Customers gave it a favourable rating (3) as well. Safety is generally accepted as a crucial component of sustainable farming methods.

The perceived relevance of **education expenditures** varied. With a moderate rating of 2.3, farmers show to be unsure of the relationship between education investments and labor outcomes on farms. Farmers' organizations gave it a higher average (3.7), indicating an institutional view that education is essential for long-term social resilience and equity, while advisors and consumers rated it low (2).

Farmers gave the **gender wage gap** a low average rating of 1.8, whereas advisors (5) and organizations (4.3) gave it high priority. This underscored its crucial significance from a governance and rights-based standpoint. Additionally, consumers gave it a comparatively high rating of (4), which probably reflects the rising social expectations for gender equality. Farmers' lower ratings might indicate that policy framing needs to be clarified or awareness raised.

Most groups placed a high value on the **promotion of social responsibility**. It received a moderate rating from farmers (3), which may indicate a practical assessment of their involvement in societal issues outside of the farm gate. It received ratings of 5 from advisors and 4.3 from farmers' organizations, respectively, emphasizing their part in promoting or influencing socially conscious behaviours like fair trade, inclusivity, and community involvement. Strong interest was also expressed by consumers (4), which reflected changing preferences for ethical consumption.

3.3.4 Use Case Denmark – value chain pig farming

Balancing the three pillars of sustainability

Stakeholder groups differ significantly in their assessment of the relative significance of the environmental, economic, and social pillars of sustainability. Suppliers (69.5%) and advisors (46.7%) place a high priority on the environmental pillar, indicating that these actors view environmental sustainability as essential to their responsibility or influence. Though somewhat less so, retailers (40%) and farmers' organizations (36.7%) also show a great deal of concern. Despite being directly exposed to environmental risks, farmers assign a lower share (30%), which may suggest that in day-to-day decision-making, short-term economic needs take precedence over long-term environmental considerations.

The economic pillar is most heavily weighted by farmers (40%) and retailers (40%), underlining the crucial importance of profitability, market stability, and operational costs in these segments. Economic considerations are also significant for farmers' organizations (33.3%) and advisors (30%). Suppliers, however, give it the least weight (20%), suggesting that while economic viability remains relevant, it may be subordinated to environmental performance in their sustainability assessments-perhaps due to growing regulatory or reputational pressures in upstream supply chains.

The social dimension is clearly the least prioritized among most stakeholders. Suppliers assign it the lowest value (10.5%), followed by advisors (23.3%) and retailers (20%). Farmers' organizations and farmers provide slightly more balanced attention (30%), potentially reflecting closer ties to labor, rural communities, and social development concerns. The

consistently lower scores for social sustainability indicate a need for greater awareness and incentives to elevate social justice, equity, and well-being as integral components of sustainable systems.

Environmental indicators

All stakeholder groups rated **global warming** as a high priority, with average scores ranging from 3 (farmers) to 4.7 (advisors). Advisors give this indicator the highest score (4.7), with a narrow range (4-5), which shows how important climate change mitigation is to the scientific community. Farmers' organizations (4.3), suppliers (4.0), and retailers (4.0) also show a lot of concern about this issue. This is probably because of climate resilience, regulatory pressures, and customers' expectations.

Stakeholders show varied concern for **terrestrial acidification**. Farmers rate it highly (4.0), probably because they are worried about the health of the soil and the effects of fertilizers. On the other hand, advisors (1.7) and farmers' organizations (2.0) give it a lower score, which suggests that people who know a lot about the issue may see acidification as a more localized or less urgent problem. The wide range of answers shows that people have different ideas about its importance.

Freshwater eutrophication scores are moderately important to stakeholders. Advisors (3.7) and retailers (3.0) give it a little more credit than farmers' organizations (2.7) and suppliers (2.5). People who work in advisory, or consumer-facing roles may be more aware of the effects of nutrient runoff now than they were before. But the wide ranges (2-5) show that people have different levels of understanding of importance.

Most groups give **Fossil Fuel Depletion** a fair rating, but farmers (3.0) and retailers (3.0) give it the highest scores. Advisors (2.0) and farmers' organizations (1.3) gave lower ratings, which suggests that fossil fuel use is not seen as a major environmental problem, possibly because it is not directly visible in farming activities. Suppliers (2.5) are in the middle, which could mean they are trying to find a balance between their goals for sustainability and their concerns about costs.

Water consumption ratings go from 1.5 (suppliers) to 4.0 (advisors). Advisors probably see water stress as a problem that is getting worse around the world, especially in places that are prone to drought. The lower ratings from suppliers and organizations could be because they are less directly involved in practices that use a lot of water.

Ozone formation receives high rates only from farmers' organizations (4.3) and retailers (4.0). Due to their lack of visibility or indirect ties to this impact potential in farming contexts, advisors and suppliers do not prioritize this indicator. **Ecotoxicity**, did not receive any rating from any stakeholder group, indicating a knowledge or awareness gap in stakeholder perceptions regarding the concerns about pesticide use and biodiversity loss.

Economic indicators

Farmers gave **production yield** a high importance rating (score of 5), as expected due to its direct influence on income and productivity. Due to their reliance on steady supply volumes, retailers also recognized its importance (score of 4). On the other hand, farmers' organizations gave it a low score of 2.0 and advisors gave it a moderate importance (average score of 2.7), indicating that those groups may have shifted their focus from raw output to other sustainability or operational factors.

The importance of **subsidy dependence** was rated by stakeholders as moderate to low. Advisors gave it an average score of 2.3, with farmers' organizations providing a slightly higher score of 3.0. Because of its indirect impact on pricing and supply stability, retailers rated it as more significant (4.0). Suppliers and farmers did not rate it as important,

although it is acknowledged as an influencing factor. Probably, this indicator is not regarded as essential for economic performance assessment.

Revenues were widely acknowledged as a crucial economic indicator. It received a score of 4.0 from farmers, and a higher rating of 4.5 from farmers' organizations. The slightly lower scores (3.3 and 3.0, respectively) from advisors and suppliers may indicate a more balanced perspective on cost structures and gross income. Retailers, on the other hand, gave revenue importance a lower rating (2.0), which might suggest that they place more emphasis on cost control and profitability than on top line revenue.

Advisors and suppliers gave **net profit** the highest possible score (5.0), making it one of the most valuable indicators. This indicates that overall economic performance and viability are highly valued. However, retailers gave the indicator a moderate rating of 3.0 and farmers' organizations a much lower rating of 2.0, indicating either different organizational economic priorities or practical difficulties in maintaining steady profit margins.

Most groups considered **OpEx** to be moderately to highly relevant. In keeping with the constant need to control recurring expenses, farmers (4.0), advisors (3.3), and retailers (3.0) underlined its significance. This indicator received a lower rating from farmers' organizations (2.0), which may be a result of a more collaborative budgeting process with varying cost pressures. In line with their operational focus and margin management, suppliers demonstrated a high level of OpEx (5.0) awareness.

CapEx was given less attention, particularly by farmers' organizations (1.5). It received moderate ratings (3.3, 4.0, and 3.0 from advisors, suppliers, and retailers, respectively). This implies that even though CAPEX is recognized, more pressing financial issues like operating costs or profit are prioritized.

Social indicators

All stakeholder groups agreed that **fair income** is important. It received a moderate rating of 3.0 from farmers, and similar ratings of 3.0 to 3.3 from advisors and retailers, suggesting broad support but perhaps little authority or accountability in execution. Interestingly, farmers' organizations placed a high priority on fair wages (score of 5.0), highlighting their function in promoting fair labour practices. Suppliers also acknowledge its significance (3.5).

Farmers, advisors, and retailers all gave **health expenditures** a score of 3.0, indicating that they were considered to be moderately important. More variation was seen among advisors and suppliers (up to 5), indicating that although health is acknowledged, its importance may vary. A higher score (4.0) was awarded by farmers' organizations, demonstrating their alignment with long-term wellbeing objectives for rural communities and farm workers.

The majority of stakeholder groups rated **safety measures** as one of the most important social indicators. Its crucial role was recognized by advisors (4.3), farmers' organizations (4.0), suppliers (4.0), and retailers (4.0). This points the widespread agreement regarding the significance of protecting workers in settings related to agriculture and food processing.

More conflicting attention was paid to **educational expenditures**. Advisors gave it a lower score (2.3), while retailers (4.0) and farmers' organizations (3.0) gave it a moderate rating. Due to perceived distance from core operations or difficulties measuring educational investments, farmers and suppliers did not evaluate the indicator.

Only a few groups assessed the **gender wage gap** indicator, and they all received moderate scores: advisors (2.7), farmers' organizations (4.0), and no data from suppliers or farmers. This implies that even though the problem is acknowledged, particularly by representative bodies, its importance in daily decision-making may still be changing.

Promoting social responsibility stood out as a top priority among all social indicators. It received the highest rating (5.0) from advisors and farmers' organizations, demonstrating a strong commitment to incorporating moral and community-focused practices into business operations. Farmers and retailers gave it a slightly lower rating (4.0), but it was still in the high range, indicating that they agreed that it was relevant. It received a significantly lower rating from suppliers (2.0), which might suggest that they are not as involved in larger social projects outside of compliance.

3.3.5 Use Case Germany – organic dairy farming

Balancing the three pillars of sustainability

The survey findings show a pronounced difference in the ways that various stakeholder groups rank the environmental, economic, and social sustainability pillars: the economic pillar is typically given the most weight by **farmers** (38.3%), followed by the environmental pillar (33.5%) and the social pillar (28.3%). Their realistic concerns about operational viability and profitability, while still acknowledging their environmental responsibilities, are reflected in this balance. The environmental pillar is the one that **advisors** focus on the most (55%), while economic (25%) and particularly social (18.3%) issues receive much less attention. This probably reflects a viewpoint focused on policy considerations and long-term systemic sustainability. A balanced distribution is shown by **farmers' organizations**: social (30%), environmental (30%), and economic (40%). This implies an integrated approach to sustainability, which probably reflects their support of both more general sustainable practices and farmer viability. While the **agri-food industry** rates equally environmental and social pillars at 22.5%, clearly favours economic factors at 55%. This probably highlights a business-driven viewpoint that prioritizes financial performance and addresses sustainability where it relates to financial objectives.

Environmental indicators

Different priorities and viewpoints regarding the environmental effects of agriculture and food production were revealed by the weighing of environmental indicators across the different stakeholder groups.

All groups paid relatively much attention to **global warming potential**; advisors giving it the highest rating of (5), and farmers an average of 3.3, demonstrating a high level of climate change awareness. A smaller perceived direct connection to their operational decision-making may be the reason why farmers' organizations and the agri-food sector assign lower values (2.5 and 1.5, respectively). Nonetheless, most people agree that global warming matters, particularly for those involved who have more general environmental or policy viewpoints.

Terrestrial acidification is underrated, especially by farmers who gave it a significantly low priority (0.3). The fact that only farmers submitted specific scores here suggests that most stakeholders do not fully comprehend or find this impact to be significant.

Farmers' organizations give **freshwater eutrophication** a high rating of 4.5, while farmers and advisors give it a low rating of 0.8 and 1.3. This disparity implies that advocates working in collective or regional capacities value it more than practitioners working alone, perhaps as a result of their understanding of the wider effects that water quality has on ecosystems and communities.

The importance of **land use** is widely acknowledged; advisors and farmers' organizations give it a rating of 5 and 4.5, respectively, and farmers give it a good average of 2.8. Perhaps because of its close connections to sustainability, biodiversity, and productivity, this consistency emphasizes how land use is viewed as a concrete and significant factor.

All groups give **water consumption** moderate ratings, with the agri-food industry giving it the highest rating (4.5). This could be a reflection of worries about operational risks associated with water and resource efficiency, especially in supply chains or processing. Farmers rate it 2.3, indicating that while it is acknowledged, it may be overshadowed by other water-related issues like irrigation costs or rainfall variability.

With an average score of 2.8, only farmers gave **fossil fuel depletion** a rating, suggesting some concern, perhaps related to the use of fuel in vehicles and machinery. Similarly, **ozone formation** was rated by only farmers (2.3), much like fossil fuel depletion. This could indicate a lack of knowledge about the effects of ozone or that other indicators are viewed as more urgent.

Economic indicators

Different stakeholder groups' priorities and perceptions of the factors influencing or driving economic sustainability in the agri-food industry were revealed by the evaluation of economic indicators.

Production yield is highly valued by farmers and the agri-food sector (4.5), highlighting its crucial role in primary production and supply chain effectiveness. It is less important for advisors (3) and farmers' organizations (1.5), presumably because they take a more comprehensive approach to economic performance or give precedence to long-term results over short-term productivity.

With averages ranging from 1 (advisors) to 2.3 (farmers), **subsidy dependence** receives low scores overall. The comparatively low importance might be a sign of a desire for financial independence or a belief that subsidies are not a strategic or long-term economic tool. The farmers' organization notably withheld data, presumably because of varying opinions on policy dependence.

Remarkably, **revenues** score poorly overall, especially from advisors (1.3) and farmers (1.8). This could indicate that revenues by themselves are not thought to be a reliable indicator of the state of the economy, perhaps as a result of volatility, fluctuations, or their separation from profitability.

With a rating of 5 from farmers' organizations and the agri-food sector and a moderate to high priority from farmers and advisors (2.5 and 3.3), **net profit** is consistently regarded as one of the most significant indicators. The primary objective of economic sustainability is reflected in the heavy focus on profit, which guarantees financial viability above and beyond basic income.

The low scores for all stakeholders indicate that **OpEx** is acknowledged but not regarded as a crucial metric that influences decisions. It may be regarded as a secondary concern or indirectly addressed through profitability metrics, as indicated by the ratings of 2.5 and 1.3 given by farmers and advisors, respectively, and the lack of data from some groups.

One of the least important metrics, particularly for farmers, is **CapEx** (0.8). Even though the agri-food industry (2) and farmers' organizations (3) express greater interest, overall CapEx is probably seen as less immediate or significant, particularly for smaller-scale operators.

Social indicators

Social sustainability aspects like justice, equity, and community well-being are prioritized by different actors in the agri-food value chain, as revealed by the assessment of social indicators across stakeholder groups.

A strong consensus on the significance of **fair income** for workers is reflected in the consistently high rankings, particularly among advisors (4.3) and farmers (4.8). On the other hand, the agri-food industry (2) and farmers' organizations (2) exhibit less prioritization. This

could indicate a strategic detachment from labour concerns or an emphasis on cost control in larger-scale operations.

Health-related issues are given varying degrees of attention. Although farmers (2.8) express a moderate level of interest, advisors (1) and farmers' organizations (1.5) give it a low rating. This may reflect a belief that **health expenditures** are either outside the purview of direct operations or are challenging to evaluate in the context of agri-food. It also receives little attention from the agri-food sector (2), which may indicate that occupational health is not adequately considered in sustainability evaluations.

Safety measures reveal a notable discrepancy. Despite its importance to on-farm operations, farmers give it a very low rating (1). However, the agri-food sector (2.5) and farmers' associations (2) give safety a marginally higher, albeit not significant, weight.

It is evident that advisors (5) place a high priority on **education expenditures**, most likely as a result of their professional alignment with capacity building and knowledge transfer. Although the farmers' organization (2.5) is more reserved, farmers (3.3) and the agri-food sector (4) also view education as important. While education is acknowledged, some groups may view it as more pertinent to external stakeholders than internal business practices.

Advisors (3) and farmers (2.3), in particular, give the **gender wage gap** a moderate amount of priority. The lack of information from the agri-food industry and farmers' organization probably indicates a lack of information, uncertainty, or unease discussing this delicate subject.

Farmers (2.5) and advisors (2.7) rated the **promotion of social responsibility** as moderately engaged, while farmers' organizations (4) gave it a higher rating. It received a lower rating from the agri-food industry (2), indicating that stakeholders' interpretations and implementations of wider corporate social responsibility commitments vary.

4. WP4 session: Validation of fair business practices and models

4.1 Background and objectives of the session

One of the key objectives of the BEATLES project is to develop fair business strategies for the transition to sustainable, productive, and CSA²¹. To pursue this objective, WP4 has been tasked to develop fair value propositions and a portfolio of fair business models. Central to these tasks is the pivotal concept of fairness. In BEATLES, four dimensions of fairness have been distinguished that together form the complex construct of fairness²²:

1. **Distributive fairness** – focuses on outcome distributions or allocations based on needs, equality, and equity.
2. **Procedural fairness** – pertains to fairness of the procedures used to determine outcome distributions based on consistency, bias suppression, accuracy, correctability, ethicality and representativeness.
3. **Interpersonal fairness** – the degree to which people are treated with politeness, dignity, and respect by those executing procedures.
4. **Informational fairness** – focuses on the quality of the information provided about the procedures resulting in outcome allocations.

The 2025 CCWs builds on the outcomes of the 2024 CCWs (see Section 1.3). The objective of the 2025 CCWs was to co-design the suggested fair business model prototypes and co-validate them as real options in each of the Use Cases. The fairness framework discussed during the 2024 CCWs were further validated with the UC value chain stakeholders.

4.2 Overview of the session

Within this context, WP4 co-developed and contributed an agenda which formed two parts to the 2025 CCWs. The agenda was designed to tackle two specific objectives - to co-explore stakeholders' **validation of fair value propositions and practices and the validation of fair business models (presented as 13 possible prototypes)**. The detailed analysis and discussion of these two exercises are reported here and also in even more depth in the BEATLES Deliverables 4.2 and 4.4, respectively.

4.2.1 Validation of fair value propositions and practices

In T4.2, a collection of business practices were developed that are found to increase fairness perceptions of business actors. What is considered fair depends on a lot of factors, including the business and institutional contexts, as well as personal norms and beliefs. A short survey was carried out in the five workshops to test a number of the findings from the BEATLES research on **norms and perceptions of the fairness in business relations**. The survey builds on the outcomes of the 2024 CCWs where the four fairness norms – distributional, procedural, informational and interpersonal fairness, were first introduced and discussed.

²¹ [Concept & Objectives \(beatles-project.eu\)](https://beatles-project.eu)

²² BEATLES Deliverable 4.1. "Portfolio of fair value propositions v1". Report on the segmentation analysis and the set of fair value propositions. <https://beatles-project.eu/wp-content/uploads/2024/06/D4.1-Portfolio-of-fair-value-propositions-v1.pdf>

4.2.2 Validation of fair business models

WP4 developed a portfolio of fair BM models consisting of 13 prototypes, based on findings from 2024 co-creation activities and interviews held with farmers and stakeholders in T4.3. The details of the fair BM prototypes and how they were developed will be presented in Deliverable 4.4. A draft of this portfolio was used in the CCWs to validate the assumptions of the business models' design. Table 5 lists the business model prototypes that were shared with the Use Cases. Following the methodology employed by WP4 in the design and development of the prototypes, the Use Cases were tasked with choosing 3 or 4 of these prototypes for validation during the CCWs. Their selection of prototypes was informed by the changes prioritized by stakeholders in the 2024 CCWs.

Table 5. The 13 business model prototypes that were developed for potential validation

Prototyping results: The fair business model prototypes

Fair business models prototypes	Core solution
Pay for success	Farmers are rewarded for achieving jointly agreed and measurable climate-smart outcomes.
Crowdfarming	Farmers receive upfront financial support through consumer adoption of farm assets or products
Consumer driven pricing	Farmers collaborate with consumers to set fair prices that reflect sustainable production standards
Risk-sharing fund	Farmers are financially protected against income loss or unforeseen expenses through a risk-sharing fund when implementing climate-smart agriculture practices
Bio-districts	Farmers benefit from local collaborations realized through a formal agreement to promote sustainability and market access.
Retail-choice editing	Farmers gain assured markets as retailers "edit out" unsustainable products, simplifying choices for consumers

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Prototyping results: The fair business model prototypes

Fair business models	Core solution
Open source	Farmers co-create with stakeholders and access practical tools and solutions for climate-smart agriculture
Outcomes-based pricing	Farmers access advanced agricultural technologies with no upfront costs, paying only if the technology delivers agreed-upon outcomes
Shared resource pool	Farmers share access to advanced technology on a rental or pay-per-use basis.
Transparency branding	Farmers, processors and retailers collaborate to showcase their sustainability impact, challenges and controversies in the transition towards CSA building brand trust.
Consumer engagement platform	Farmers, processors, retailers are supported as consumers make informed sustainable purchasing choices based on the environmental impact of their purchases
Peer to peer knowledge sharing	Farmers exchange practical knowledge and best practices through an inclusive platform with external stakeholders providing supportive validation.
Data cooperation network	Farmers collaborate with competitors to share anonymized data for benchmarking and insights.

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The prototypes chosen by each Use Case were assigned to a group of stakeholders. Guided by an assumption prioritization canvas developed by WP4 (Figure 6), stakeholders were asked to evaluate each assumption based on relevance and plausibility and map the results of the discussion in the canvas.

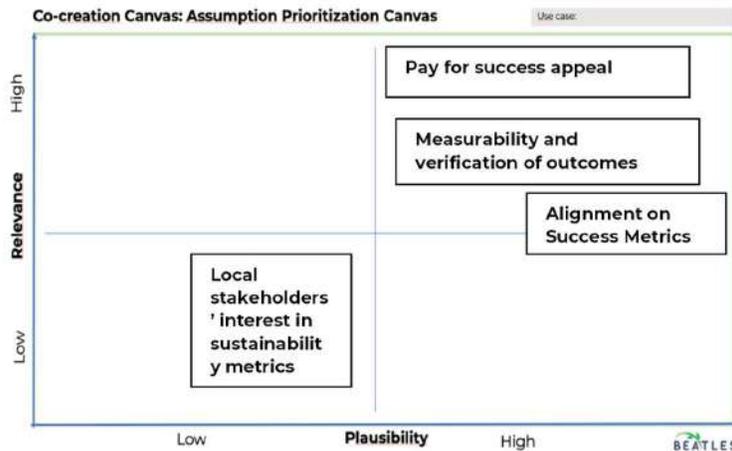


Figure 6. Example of the validation of the business model prototype – Pay for Success for pig farming in Denmark

The following is an example of how CCW participants were instructed to analyse the chosen business models in a co-creative manner. This example is for the **Pay-for-Climate-Smart Agriculture Success Prototype**. The key assumptions underlying this business model were as follows:

Assumption 1: Pay-for-Success Appeal: *Farmers are motivated by the model and are willing to adopt climate-smart practices if financial rewards are linked to key performance indicators (KPIs) for climate-smart outcomes.*

<p>1. Relevance: Does this assumption matter? <input checked="" type="checkbox"/> YES! (If I don't get paid for sustainable practices, I won't adopt them.) <input checked="" type="checkbox"/> NO! (I already practice sustainability for other reasons—money isn't the key driver.)</p>	<p>2. Plausibility: Does this assumption sound realistic? (Have I seen this happen before?) <input checked="" type="checkbox"/> YES! (I've seen farmers adopt new practices when financial incentives are strong and fair.) <input checked="" type="checkbox"/> NO! (I've seen farmers are skeptical because past payment schemes have failed or been unreliable.)</p>
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Assumption 2: Measurability and Verification of Outcomes: *Farmers and stakeholders trust that outcomes like soil health improvements or emissions reductions can be measured and verified accurately.*

<p>1. Relevance: Does this assumption matter? <input checked="" type="checkbox"/> YES! (I want payments to be fair and based on measurable and verifiable data.) <input checked="" type="checkbox"/> NO! (I don't care about</p>	<p>2. Plausibility: Does this assumption sound realistic? (Have I seen this happen before?) <input checked="" type="checkbox"/> YES! (Technology like remote sensing, soil testing, and blockchain makes measurement reliable.) <input checked="" type="checkbox"/> NO! (I've seen certification systems</p>
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measurement—I just want support for implementing sustainable practices.)	fail—data can be wrong, expensive to collect, or biased.
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Assumption 3: Local Stakeholders’ Interest in Sustainability Metrics: *Local stakeholders (government, consumers, investors) are willing to fund/pay for sustainability-linked products and share financial risks in exchange for measurable environmental benefits.*

<p>1. Relevance: Does this assumption matter? <input checked="" type="checkbox"/> YES! (If local stakeholders aren't involved, the funding won't be there.) <input checked="" type="checkbox"/> NO! (I don't need local funding—I sell my products to bigger buyers or abroad.)</p>	<p>2. Plausibility: Does this assumption sound realistic? (Have I seen this happen before?) <input checked="" type="checkbox"/> YES! (Consumers and governments are already paying for sustainability through certifications and green finance.) <input checked="" type="checkbox"/> NO! (Local investors and governments talk about sustainability, but they don't always invest real money.)</p>
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Assumption 4: Alignment on Success Metrics: *Farmers and local stakeholders can agree on clear and shared definitions of success for climate-smart practices.*

<p>1. Relevance: Does this assumption matter to me? <input checked="" type="checkbox"/> YES! (If we don't agree on success, I might not get fairly paid.) <input checked="" type="checkbox"/> NO! (As long as I get paid, I don't care what "success" means to others.)</p>	<p>2. Plausibility: Does this assumption sound realistic? (Have I seen this happen before?) <input checked="" type="checkbox"/> YES! (Some programs already define success using clear indicators like carbon sequestration and biodiversity gains.) <input checked="" type="checkbox"/> NO! (Sustainability means different things to different people—one stakeholder might care about soil health, while another cares about emissions.)</p>
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This approach was taken to assess each of the chosen business model prototypes within the Use Cases (see section 4.4).

4.3 Outcomes of the session on the fairness framework

The session served as a platform for stakeholders to share their perspectives on fairness and discuss how to improve fairness in the value chain within the five Use Cases. Based on the 2024 CCWs where necessary changes were suggested to achieve greater levels of fairness, a survey was conducted during the 2025 CCWs to help validate a fairness framework focused on practices and attitudes. Also prior to this, data have been gathered from the five CCWs and reported in Deliverable 4.2 by WP4.

The raw data from the CCW validation questionnaire on fairness norms and attitudes are found in Appendix 7.2. The results are summarized below.

4.3.1 Lithuania fairness framework survey results

The Lithuanian Use Case fairness survey results highlight mostly positive perceptions across all five dimensions, with notable variations by stakeholder category: *Farmers, Input Suppliers, and Other Stakeholders.*

Distributional Fairness is rated relatively high by all groups, with *Other Stakeholders* giving the highest average (4.5). *Input Suppliers* rated both parity in pay and payment according to effort at a perfect 5.0. However, they rated “being paid enough to cover costs” significantly lower (3.0), highlighting a major concern in financial sustainability. *Other Stakeholders*, in contrast, rated that item at a perfect 5.0.

Procedural Fairness sees mixed ratings. *Farmers* (4.3) and *Other Stakeholders* (4.5) generally agree on the fairness of procedures, with high scores for the ability to challenge mistakes (4.8–5.0). *Input Suppliers* show weaker confidence, rating fairness of application and information provision at just 3.0. Data gaps in their responses also suggest disengagement or limited awareness of procedural frameworks.

Informational Fairness is widely perceived as strong. *Other Stakeholders* rated this dimension highest (4.7), especially for the honesty and understandability of communication (up to 4.8). *Input Suppliers* gave a perfect 5.0 to the clarity of information, though slightly lower scores (4.0) for responsiveness and honesty suggest room for improvement.

Interpersonal Fairness received the highest ratings across the board. *Input Suppliers* gave a perfect 5.0, while *Farmers* and *Other Stakeholders* followed closely with 4.8 and 4.3 respectively, reflecting broad satisfaction with respectful and polite treatment within the supply chain.

In the “**What is Fair**” category, perceptions are more mixed. *Farmers* view their earnings more positively (4.2) than *Other Stakeholders* (3.3), while the latter group rated fairness in procedures highest (4.5). *Input Suppliers* rated interpersonal treatment at a perfect 5.0, again confirming strong relational satisfaction.

In summary, Lithuanian stakeholders express strong interpersonal and informational trust, but there are tensions around procedural consistency and financial sufficiency—particularly for *Input Suppliers*. These nuances indicate that while fairness is broadly perceived, targeted improvements in cost coverage and procedural clarity could enhance overall equity.

4.3.1 Netherlands fairness framework survey results

The Netherlands Use Case fairness survey shows several notable trends across stakeholder categories (*Farmers*, *Processors/Traders*, *Other Stakeholders*, and *Mixed Farmers/Traders*) and the five fairness dimensions: Distributional, Procedural, Informational, Interpersonal, and General perceptions of fairness.

Distributional Fairness shows strong agreement among most stakeholders that they are paid according to efforts and costs (scores of 5.0 across three groups), with *Mixed Farmers/Traders* reporting lower satisfaction, especially regarding payment covering costs (3.0) and parity with supply chain partners (2.5), indicating a perceived imbalance.

Procedural Fairness is generally rated high across groups, particularly among *Mixed Farmers/Traders* (avg 4.8), who scored a perfect 5.0 on several items including rights respect and the ability to challenge procedural mistakes. The lowest average (4.2) is seen among *Processors/Traders*, suggesting minor concerns about consistency or responsiveness.

In **Informational Fairness**, *Other Stakeholders* and *Mixed Farmers/Traders* reported near-perfect satisfaction, particularly with honest communication and understandability of information (both 5.0). *Processors/Traders* again ranked slightly lower, particularly in getting explanations when things go wrong (4.0).

Interpersonal Fairness is perceived positively across all groups, with *Mixed Farmers/Traders* scoring highest (5.0) and others closely aligned around 4.3–4.5, indicating widespread respect and politeness in interactions.

Finally, the “**What is fair**” category reveals the greatest disparities. *Farmers* rate all aspects significantly lower than others (scores from 2.2–2.8), especially in perceptions of their own earnings (2.3). In contrast, *Mixed Farmers/Traders* consistently rate fairness elements highest (4.0–5.0), indicating a more favorable view of overall supply chain dynamics.

In summary, while procedural and interpersonal fairness are broadly rated high, distributional and perceived fairness around earnings vary notably by stakeholder type, with *Farmers* feeling least satisfied and *Mixed Farmers/Traders* most positive.

The main points of discussion that followed the survey providing feedback on the fairness framework were as follows:

Regarding the fair business practices within the distributive category, most of the participants selected earnings and risk division. There was agreement within the group that a fair distribution of profit margin and division of risk is the basis for a sustainable way of working within the chain. Quality was also considered very important, however the perception was that quality is, among other things, sometimes dependent on variables outside the scope of growers (like weather conditions) while simultaneously the risk, e.g. cost of climate-smart measures, is only carried by growers. How should this risk be shared within the value chain? Some participants argued for obligated and explicit compensation, others suggested that retailers should exclusively sell Planet Proof certified products. Within the procedural category, most participants chose “no unfair practices” as most important. At the moment, some growers and traders felt that retailers sometimes use the movement of the market with price negotiations, for example to pay a regular price for Planet Proof-grown potatoes even when there is no demand for these. A fixed compensation should always be paid. Also, most participants felt that formal monitoring and control are important, as is the case within Planet Proof.

All participants strongly expressed the need and willingness for collaboration and sharing of knowledge and data within the value chain and felt that working together will bring them further along. A need for transparent sharing of information and what it is used for was called for. Most growers felt like they have to provide a lot of data, but they don't know what these end up being used for. Sharing information throughout the value chain is necessary to show the “consumer” what is being done in order to increase willingness to pay for that. However, some doubts were expressed if the retail parties are willing to “invest” in a general certification scheme for all parties in the market. Retailers want to differentiate from their competitors, so maybe each retailer should set up its own “label” and therefore increase willingness to invest in such a label.

4.3.2 Denmark fairness framework survey results

The results of the Denmark Use Case fairness survey show strong consensus and stark differences in the stakeholder responses across the five dimensions of fairness.

Distributional Fairness exhibits high agreement on being paid according to efforts and costs, with *Farmers*, *Input Suppliers*, and *Processors/Traders* all scoring a perfect 5.0 for effort-based payment. However, significant disparity emerges regarding parity with supply chain partners: *Input Suppliers* rate this just 1.0—the lowest score across the entire dataset—while *Processors/Traders* rate it 5.0. This signals a major perceived imbalance in comparative remuneration.

In **Procedural Fairness**, *Input Suppliers* stand out with consistently perfect scores (5.0) on most items, indicating strong satisfaction with fairness and reliability in procedures. By contrast, *Farmers* and *Processors/Traders* generally rate procedural aspects around 4.0, while *Other Stakeholders* express somewhat lower confidence, especially in whether their specific interests are addressed (3.5).

Informational Fairness is rated highly across all groups. *Input Suppliers* again rate all aspects at 5.0, especially for communication honesty and understandability, while *Farmers* rate clarity of information slightly lower (3.5). Nonetheless, overall results indicate strong communication and transparency in the supply chain.

Interpersonal Fairness is where the widest gap appears: *Farmers* rate their experience at 4.5, while *Input Suppliers* report the lowest interpersonal rating (2.0), suggesting a lack of respect or civility in their interactions. Other stakeholders fall in between, with *Processors/Traders* at 4.0 and *Other Stakeholders* at 3.5.

In the **"What is Fair"** category, evaluations are mixed. *Farmers* expressed skepticism about partner earnings (2.5) despite rating business procedures relatively high (4.5). *Input Suppliers* report more favorable views of their own treatment and earnings (4.0). Ratings from *Processors/Traders* and *Other Stakeholders* are generally neutral to positive (3.0–4.0), though some data is missing.

In summary, while all groups affirm strong communication and procedural consistency, fairness perceptions around payment parity and interpersonal respect vary widely, especially for *Input Suppliers* and *Farmers*. These divergences point to specific pressure points within the Danish supply chain, especially in perceived equity and relational dynamics.

In the discussion that followed there was agreement that standardization is missing in framing the definition of what is sustainable. This is important and beneficial for both farmers, industry, policy makers, consumers and retailers. Without standardization or at least some common understanding about what sustainability is, it can be difficult for farmers to meet requirements for consumers and retailers, but it may also be difficult for technology providers and innovators to prioritize development.

4.3.3 Spain fairness framework survey results

The results of the Spain Use Case fairness survey show important trends in stakeholder perceptions across the five fairness dimensions. While overall evaluations are generally positive in procedural, informational, and interpersonal fairness, major differences appear in perceptions of earnings and equity among stakeholder groups.

Distributional Fairness is rated consistently high by all stakeholders. *Retailers* report the highest satisfaction (avg 4.7), scoring 5.0 for both payment according to efforts and cost coverage. *Farmers*, while generally positive (avg 4.2), give a lower score for parity in payment with supply chain partners (3.3), which is an indication of a perceived earning imbalance.

Procedural Fairness sees strong scores, particularly from *Processors/Traders* (avg 4.6), who rate the ability to challenge mistakes and respect for rights a perfect 5.0. *Farmers* give the lowest score (3.0) for consistent application of procedures, indicating concerns about uniformity. Nevertheless, all stakeholders rate procedural respect for rights at the maximum level (5.0).

Informational Fairness is also strong, with *Processors/Traders* giving a perfect score (5.0) for the understandability of information. However, *Retailers* and *Other Stakeholders* rate

this aspect lower (3.5), suggesting a gap in communication clarity. Honesty in communication is perceived especially well by *Retailers* (5.0).

Interpersonal Fairness shows unanimous and exceptional ratings across all groups (5.0), reflecting universal satisfaction with respectful, polite treatment in interpersonal interactions.

In contrast, the **“What is Fair”** category exposes the most significant divergences. *Farmers* report the lowest scores in nearly every item, particularly for their own earnings (2.3), partner earnings (2.3), and business procedures (2.1). Meanwhile, *Other Stakeholders* and *Processors/Traders* consistently rate these aspects higher (up to 4.5 for interpersonal treatment), suggesting much more positive perceptions of fairness in practice.

In summary, stakeholders in Spain largely agree on high levels of procedural consistency, communication quality, and interpersonal respect. However, *Farmers* feel significantly disadvantaged in terms of earnings and parity, highlighting a core area of perceived unfairness in the distribution of economic value within the supply chain.

4.3.4 Germany fairness framework survey results

The results of the Germany Use Case fairness survey show distinct patterns across the five fairness dimensions, highlighting both consensus and divergence among the stakeholder groups: *Farmers*, *Processors/Traders*, and *Other Stakeholders*.

Distributional Fairness is generally perceived positively, particularly by *Processors/Traders*, who rate all aspects highly (avg 4.6), including a perfect 5.0 for being paid according to effort. *Farmers* also score this area well (avg 4.3), with their highest score (4.5) on parity with supply chain partners. In contrast, *Other Stakeholders* express the greatest dissatisfaction with equal payment (2.3), indicating concerns about imbalance.

Procedural Fairness is rated moderately across all groups, with averages between 3.6 and 3.8. The lowest score (2.3) comes from *Other Stakeholders* regarding the consistent application of procedures, suggesting perceived procedural inequality. *Farmers* rate lowest (3.0) on whether their specific interests are addressed, indicating a perceived lack of individual consideration.

Informational Fairness scores are relatively strong and consistent across stakeholders (4.2–4.3 avg). *Processors/Traders* give the highest ratings for honesty in communication (4.7), while *Farmers* mark the understandability of information lower (3.5), showing a slight gap in perceived clarity.

Interpersonal Fairness varies significantly. *Processors/Traders* provide the highest average (4.7), indicating excellent treatment by partners. Conversely, *Farmers* report the lowest average (3.5), reflecting a possible sense of neglect or diminished respect in interactions.

In the **“What is Fair”** category, perceptions drop notably across all groups. *Farmers* feel relatively more positive about their own earnings (3.7) and supply chain communication (4.5), while *Other Stakeholders* consistently give the lowest scores (3.0 across all items), suggesting a general sense of dissatisfaction. *Processors/Traders* show more neutral views (3.3–3.7), indicating moderate contentment.

In summary, the data reveals high satisfaction with distributional fairness among *Processors/Traders* and *Farmers*, but there are concerns regarding equality and procedural consistency among *Other Stakeholders*. Interpersonal and procedural fairness show the greatest variation, while informational fairness is generally stable. Perceptions of fairness in outcomes—especially earnings—remain a challenge across the board.

4.4 Business model validation across the 5 Use Cases

The five Use Cases conducted extensive business model validation exercises during the CCWs, engaging stakeholders to assess the relevance, plausibility, and challenges of implementing fair business model prototypes for CSA. Detailed results are found In Appendix 7.3.

The results of these validation exercises will be used to refine the portfolio of fair business models. Detailed analysis and discussion of these results will be presented in BEATLES Deliverable 4.4. Portfolio of fair BMs v2 (M48).

Overall observations regarding the validation of business model prototypes

Across all Use Cases, the validation exercises revealed strong stakeholder support for models promoting transparency, shared responsibility, and collaborative innovation. However, common challenges—such as funding, data governance, certification complexity, and cultural resistance—must be addressed. Future implementation efforts should prioritize education, stakeholder alignment, phased development, and robust monitoring to ensure effectiveness and long-term sustainability.

Lithuania Use Case - Lithuania's validation focused on four prototypes, emphasizing the country's challenges with knowledge dissemination, transparency, and CSA engagement. A strong theme across the stakeholder groups was the lack of funding, expertise, and sustainable equipment. Stakeholders stressed the importance of collaboration, access to information, and practical support.

- **Open-Source for CSA:** Stakeholders generally supported this model, but questioned the assumption that farmers are overly cautious. Instead, they saw farmers as open to innovation, provided there is adequate support. Key barriers include limited access to specialists, funding, and cultural constraints around collaboration.
- **Transparency Branding:** This model received broad support, but consumer education, trust in certification, and pricing were reported as key obstacles. Stakeholders emphasized that sustainability needs to be clearly communicated, starting from early education, and warned against greenwashing.
- **Consumer Engagement Platform:** Participants liked the idea but flagged a shortage of resources to build and manage such a system. Consumer willingness to engage and understand sustainability labelling remains low, and there is confusion about pricing and benefits.
- **Peer-to-Peer Knowledge Sharing:** While promising, this model faces hurdles such as a lack of organizing bodies, insufficient expert engagement, and digital literacy gaps. Cultural resistance to asking for help and limited resources for technical events were also mentioned.

Netherlands Use Case -The Dutch validation involved a structured process assessing four business model prototypes. Overall, the Dutch stakeholders recognized the potential of these models but underscored the challenges in scaling them beyond niche markets. Cooperation with retailers and chain transparency are seen as key to success.

- **Pay-for-Success:** While seen as relevant, stakeholders were sceptical about plausibility due to external factors (e.g., weather) affecting outcomes. They emphasized the importance of shared responsibility and transparency when measuring success and distributing rewards.
- **Risk-Sharing Fund:** Participants agreed on the need for clarity around what risks are covered and how compensation is determined. A major concern was potential abuse of the fund, making strong governance essential.

- **Retail Choice Editing:** This model raised questions about transparency and administrative complexity. Participants questioned how to define “sustainable” products. They also emphasized the need to ensure retailer buy-in without compromising profits.
- **Outcomes-Based Pricing:** This model was met with scepticism due to the difficulty in attributing results directly to specific farming practices. However, stakeholders expressed interest in reward-based incentives, provided outcome measurement is fair and feasible.

Denmark Use Case - Three prototypes were evaluated by mixed stakeholder groups, with emphasis on practicality, transparency, and risk-sharing mechanisms.

- **Pay-for-Success:** Seen as potentially feasible, especially if large players like Danish Crown adopt and enforce climate-friendly standards. However, concerns about narrow CO₂ metrics, greenwashing, and lack of biodiversity or animal welfare considerations were raised.
- **Risk-Sharing Fund:** Validated as highly relevant but unlikely to succeed without retailer involvement and clear demarcation of which risks are covered. Post-pandemic challenges in meat sales and consumer skepticism about sustainable claims were highlighted.
- **Retail Choice Editing:** Although the concept has high relevance, consumer confusion, financial burdens, and the immaturity of ESG measurement tools present major obstacles. Stakeholders agreed on the need for unified labelling and a phased approach to implementation.

Spain Use Case - Spanish stakeholders evaluated three prototypes and offered detailed feedback, particularly from the apple value chain.

- **Peer-to-Peer Knowledge Sharing:** Viewed as highly promising if developed collaboratively. Stakeholders valued agility, offline access, and expert validation. The model was also seen as a tool for youth engagement in agriculture.
- **Crowd-Farming:** Farmers found the model appealing for direct market access, but its success depends on consumer education, product bundling, and logistical improvements. While relevant, the willingness to prepay remains low.
- **Shared Resource Pool:** Although conceptually appealing, stakeholders were concerned about logistics, scheduling, and fairness in usage. Cultural resistance to collaboration and a lack of maintenance support were also noted.

Germany Use Case - German participants assessed four prototypes, focusing on feasibility and stakeholder alignment.

- **Pay-for-Success:** Advisors and processors expressed concern over lack of planning security and difficulties in measuring results. The risk of trade-offs that could harm overall sustainability was also noted.
- **Consumer-Driven Pricing:** This was well received. No major challenges connected with this prototype were raised during validation.
- **Bio-Districts:** While conceptually strong, implementation depends heavily on political and institutional support. Public education and stakeholder engagement are essential.
- **Data Coopetition Network:** Transparency was seen as valuable, but scepticism about data privacy and platform fatigue among farmers was expressed. The market is already saturated with tools, and added complexity may hinder adoption.

5 Workshop participants survey

5.1 Survey results

At the end of each of the five CCWs, participants were asked to complete a feedback survey, consisting of three sections to evaluate participants' perceptions on the fairness, business models, and sustainability components of the Use Case food value chain. The results are presented below in Figures 7 to 17 and completed with analyses of the different topic sessions dealing with fairness practices, business models, sustainability and levels of satisfaction with the workshops. . The responses on the X-axes are on a scale from 0 to 5 (0 being the lowest – i.e. no or disagree and 5 the highest – i.e. yes or agree completely). The Y-axes on the graphs represent number of votes (the number of stakeholders in Figure 7). Producers dominated the stakeholder composition but there was a considerable level of diversity. No results for Spain were available.

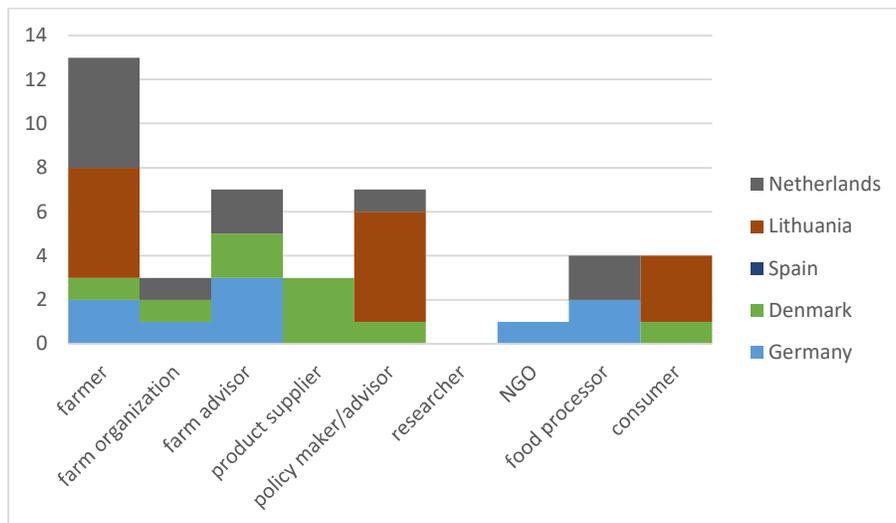


Figure 7. Stakeholder composition survey in each CCW

The stakeholder composition at the CCWs was dominantly farmers, farm organisations and farm advisors, followed by policy makers and policy advisors.

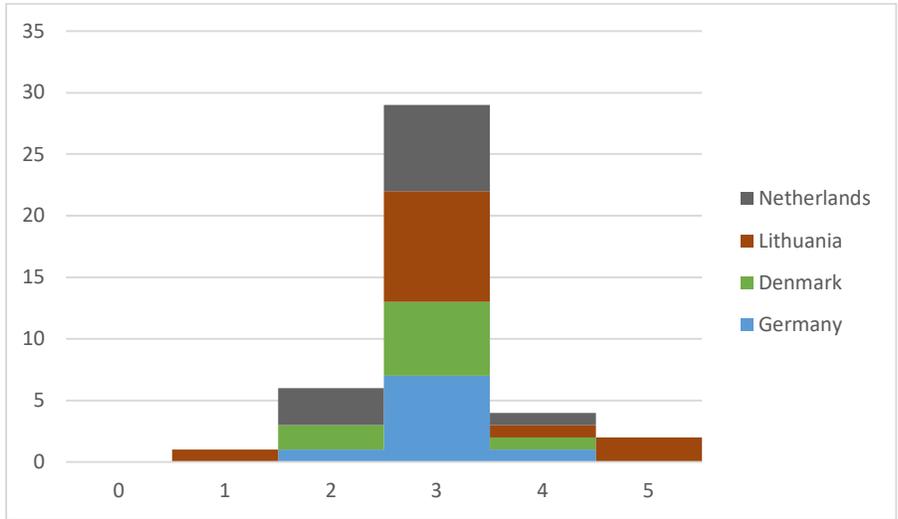


Figure 8. Response to the question “How fair would you say your food value chain of interest is?”

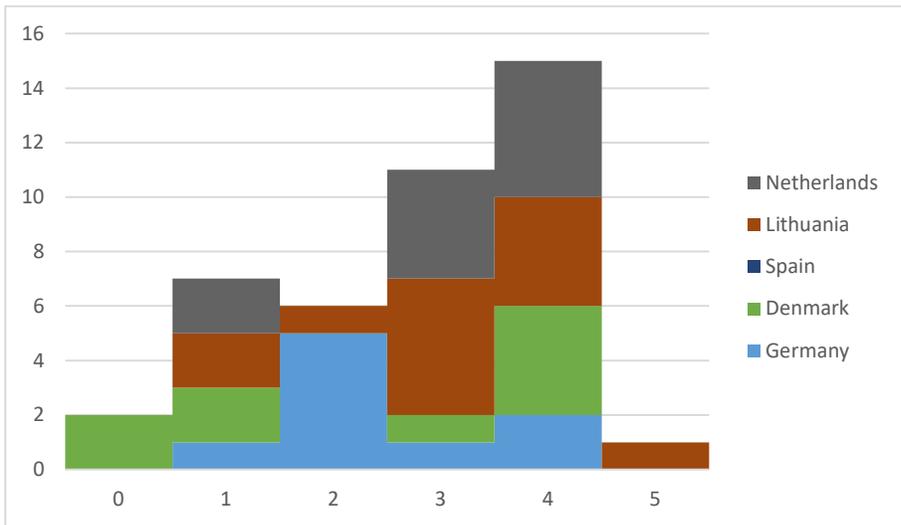


Figure 9. Response to the question “Will you use some of the changes discussed during the workshop towards a fairer value chain?”

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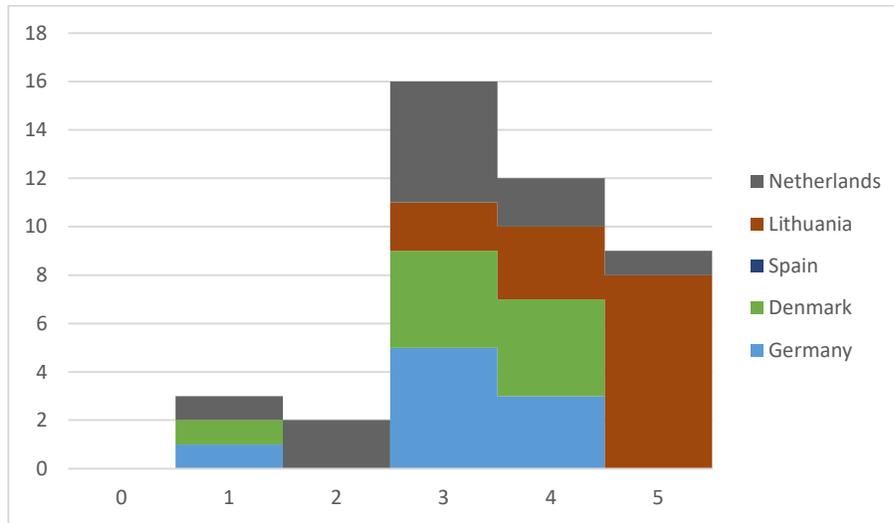


Figure 10. Response to the question "Did the workshop familiarize you with the importance of fairness in implementing CSA?"

In the fairness section in answer to the above three questions (Figure 8-10), farm organizations rated their value chains as most fair (3.33), while product suppliers and farm advisors rated them lowest (2.67 and 2.71), showing varied perceptions of fairness. In terms of willingness to invest in fairer practices, NGOs and consumers were the most proactive (4.00 and 3.50), while farm organizations and product suppliers showed the least intent (both 2.00). When evaluating the workshop's effectiveness in raising awareness, policy makers gave the highest score (4.57), followed by consumers (3.75) and farmers (3.69), suggesting strong learning outcomes. Conversely, farm organizations (2.33) and farm advisors (2.71) showed minimal perceived impact. These results reveal a consistent pattern: civil society and public actors are more engaged and responsive to fairness-related initiatives, while intermediary supply chain actors are less convinced or willing to act.

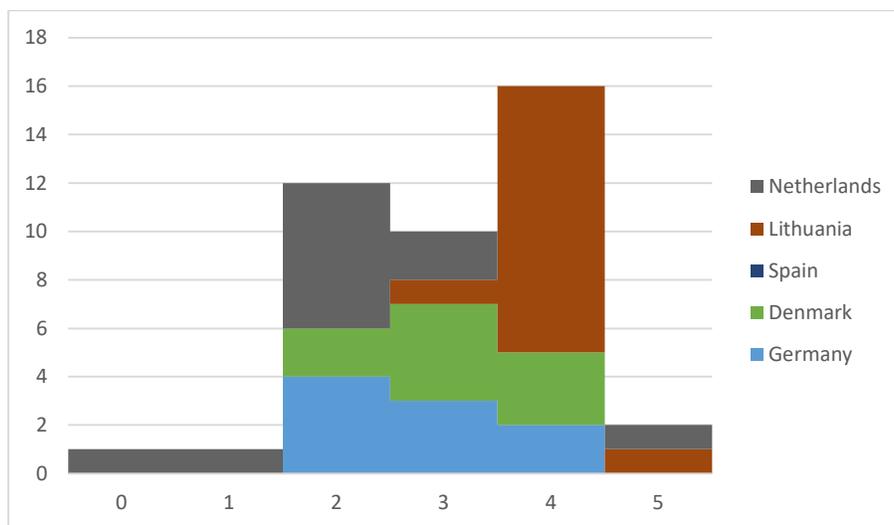


Figure 11. Response to the question "Did the workshop identify relevant fairness business models for your value chain and improve implementation of CSA?"

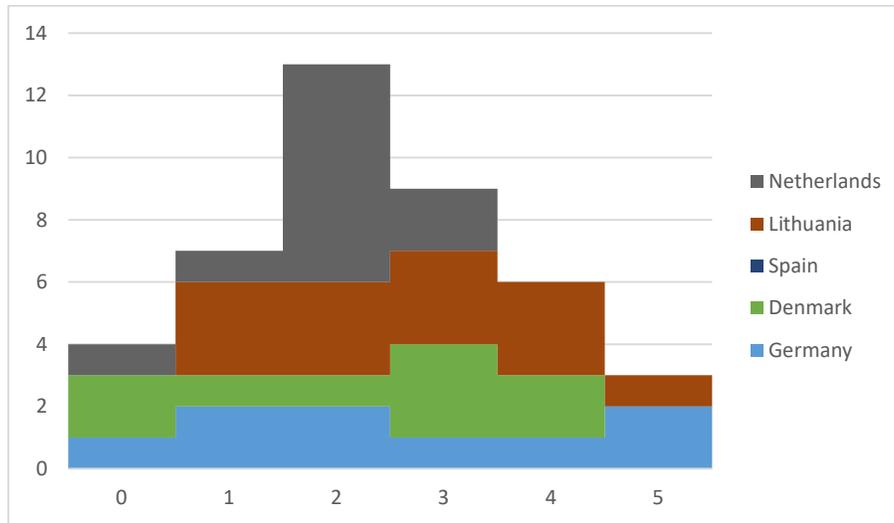


Figure 12. Response to the question "Will you use any of the workshop business model prototypes discussed?"

For the business model validation section of the workshops, in answer to the above two questions (Figures 11 and 12), the data show clear differences across stakeholder groups regarding business model insights and readiness to change. On whether the workshop helped identify relevant business models, policy makers (4.14) and consumers (4.00) responded most positively, while farm organizations and product suppliers rated it much lower (both 2.33). Farmers, food processors, and NGOs offered moderate scores, suggesting partial usefulness. In terms of readiness to adopt new business models, farm advisors (1.00) and NGOs (0.00) reported the lowest likelihood of change, possibly due to perceived lack of agency or applicability. Conversely, farmers, consumers, and policy makers scored higher, indicating moderate openness to change. Farm organizations again scored low (1.33), signalling potential resistance. These results suggest that civil society and policy actors found more value in the workshop, while intermediary and supply-side actors were less receptive or empowered to act.

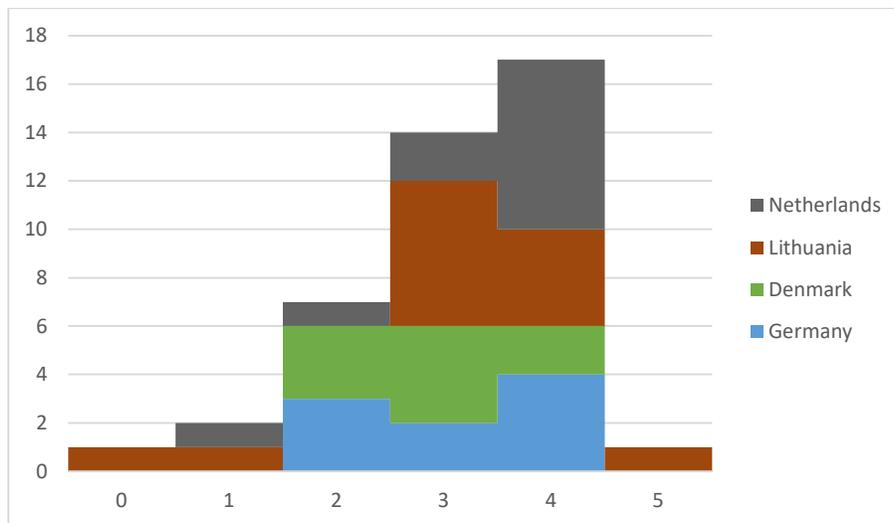


Figure 13. Response to the question "How sustainable would you describe your food value chain?"

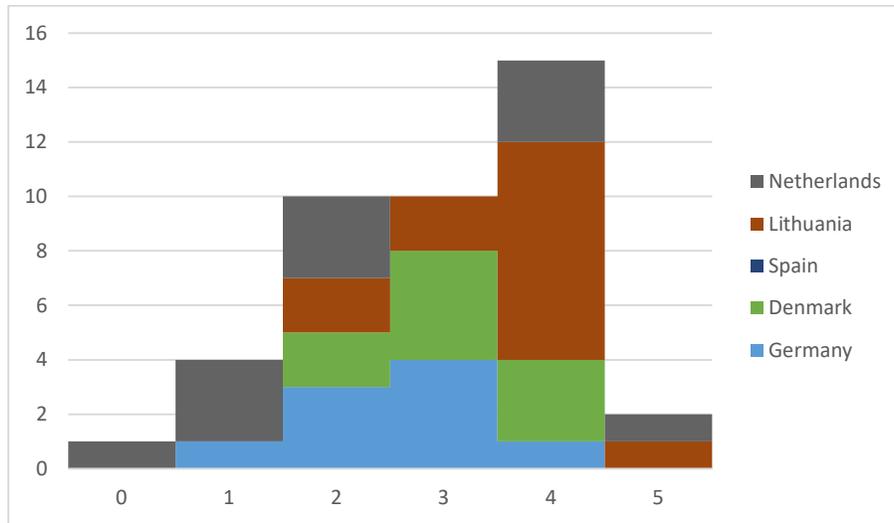


Figure 14. "Response to the question Did the workshop sustainability framework identify various impact hotspots for your food value chain?"

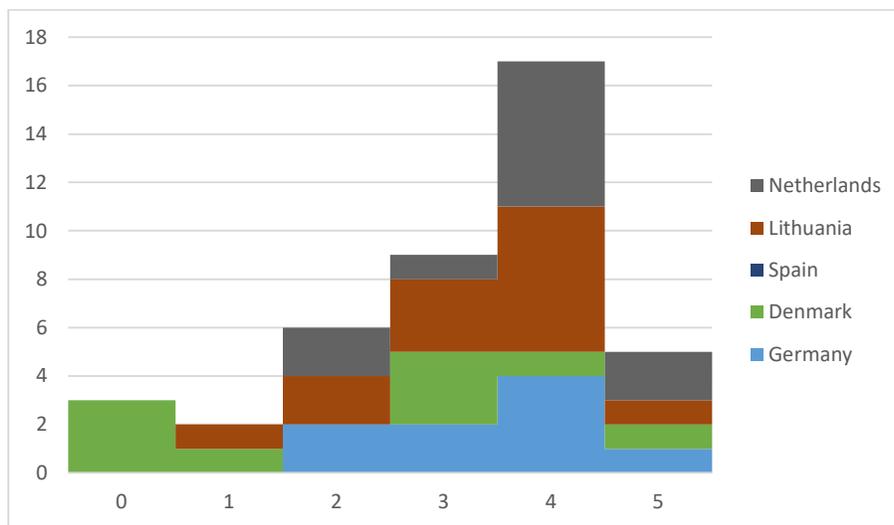


Figure 15. Response to the question "Will you use CSA to improve sustainability in your food value chain?"

In the sustainability section survey, in answer to the above three questions (Figures 13-15), farm organizations and farmers rated their food value chains as most sustainable (3.33 and 3.23), while NGOs and policy makers rated them lowest (2.00 and 2.57), indicating differing views on current performance. When evaluating the usefulness of the sustainability framework, farm advisors and policy makers (both 3.29), and consumers (3.25) found it most helpful, while NGOs (1.00) and farm organizations (2.33) found it least useful. Regarding future willingness to invest in climate-smart agriculture, NGOs (4.00), farm advisors (3.57), and farmers (3.54) expressed the strongest intent, while product suppliers (1.67) and farm organizations (2.00) were least likely to take action. The data suggests that while producers recognize sustainability, intermediary actors like farm advisors are both critical of the current state and motivated to change. NGOs appear sceptical about the framework but highly committed to sustainability action, while consumers show moderate engagement across all questions.

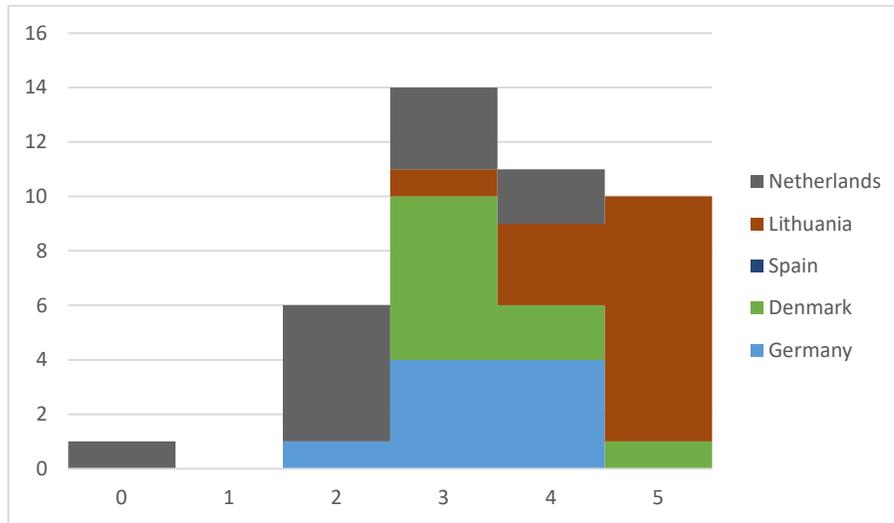


Figure 16. Response to the question "Satisfied with the outcomes from the workshop?"

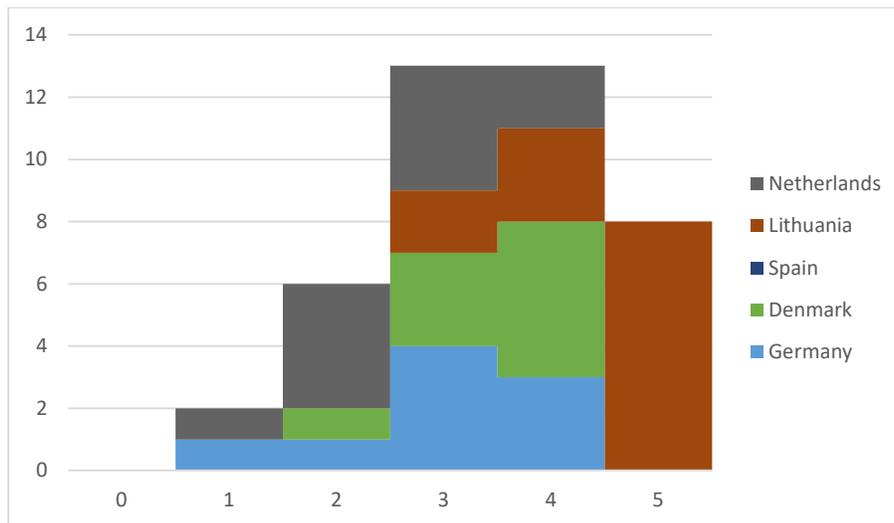


Figure 17. Response to the question "Do you recommend a similar future BEATLES co-creation workshop to a colleague?"

In the answers to the above two questions (Figures 16 and 17), satisfaction with the BEATLES workshop was highest among consumers (4.50) and policy makers (4.14), while farm advisors, product suppliers, NGOs, and food processors all reported moderate satisfaction (3.00–3.25). Farmers and farm organizations were also relatively satisfied (3.38 and 3.67). Regarding the likelihood of recommending a future workshop, policy makers again scored highest (4.14), with consumers close behind (4.00). Farmers and farm advisors also indicated a relatively high willingness to recommend (3.46 and 3.29), while food processors and farm organizations were least enthusiastic (2.75 and 2.67). These patterns suggest that policy and consumer stakeholders were the most positively engaged overall, whereas intermediary actors, particularly in the supply chain, showed more tempered enthusiasm about the workshop’s outcomes and future promotion.

With regard to obtaining more specific feedback on what things were less satisfactory with the workshops, there were no single dominating positions taken. The data were

limited to only the Netherlands and Germany cases. The following points were offered by the participants:

- poor alignment with my needs
- too ambitious and unrealistic
- need more relevant information & solutions
- need more applied examples and their impacts
- workshop missed important aspects
- discussion too long and unproductive

6 Concluding summaries

6.1 General aspects

The purpose of this Deliverable was to report on the preparation, implementation and results from the CCWs held in 2025 carried out by the five BEATLES Use Cases, while also recalling the main results of the previous workshops in 2023 and 2024. The main objectives were to focus on BEATLES WP3, dealing with a sustainability (environmental, economic and social) framework and WP4, dealing with fair business norms, practices and models. Surveys and participatory input methods were used to access the opinions of the stakeholders. The process surrounding these workshops was complex and required several planning and training sessions leading up to their execution in March 2025. Overall, the five workshops involved over a hundred people (75 participants and about 25 BEATLES Work Package and Use Case partners).

The 2025 CCWs were successfully planned and implemented due to an inclusive and iterative approach adopted by the BEATLES team members. Well-structured preparatory meetings and training sessions were important in the establishment of a common understanding among the WP and Use Case leads on the WP objectives, expected outputs, and methods of the workshops. Participation at the workshops with 75 attendees was overall better than that of the 2024 CCWs. This was as a result of the extra efforts made by the Use Case leads to promote the event and follow up with relevant value chain stakeholder representatives. The inclusion of presentations from guest experts on specific Use Case-relevant subjects was important in getting stakeholders attention and provide additional context-specific background for discussion at the workshop. This was particularly the case for the CCWs Denmark (presentations on energy optimisation and ESG accounting), the Netherlands (presentation on weed control) and Spain (presentation on agroecology). The Germany Use Case organised a farm visit.

The challenges encountered during planning and implementation of the CCW are worth highlighting. There were no clearly defined links between the priority areas that WP 3 and WP 4 proposed for discussion at the CCW. Combining the WP 3 and 4 sessions in one workshop made the agenda overly complex and compact. In addition, the amount of time allocated for the CCWs (3–4 hours) was not enough to allow for in-depth discussions during the sessions. Language remains a major challenge since the CCWs were conducted in the local languages of the various Use Case countries making it difficult for the WP partners to attend the workshops. Also, more time and effort were needed to translate into five languages the workshop materials including WP presentations and guidelines for the group exercises. The translated materials were cross-checked by the WP leads to ensure that the content was well captured.

Further analyses of the results of the workshops beyond what was presented here can be found in the respective deliverables arising from the work of WPs 3 and 4. Namely:

- D3.2 Sustainability assessment v2
- D4.2 Portfolio of fair value propositions v2
- D4.3 Portfolio of business models v1
- D4.4 Portfolio of fair Business Models v2

The following sub-sections are the “concluding summaries” arising from the 5 Use Case workshops including the sustainability and fairness framework and business model aspects.

6.2 Sustainability framework validation

This is an overview of the results of the sustainability survey carried out during the 5 Use Case workshops. The diverse array of stakeholder opinions reveals the challenges and trade-offs that policymakers need to grapple with in the process of balancing competing goals to achieve a more sustainable and equitable food systems within the EU.

Lithuania

Environmental indicators: Stakeholders in Lithuania consider global warming moderately important. Terrestrial acidification and freshwater eutrophication are given low importance, while ecotoxicity—particularly the effects of fertilizers, pesticides, and other chemicals—is viewed as one of the most significant concerns. *Economic indicators:* There is a strong emphasis on financial viability and productivity, and stakeholders recognize a trade-off between increased yield and environmental sustainability. Subsidies are seen more as helpful support than as essential to sustainability, with net profit regarded as the most important economic measure. *Social indicators:* Fair income is valued by all stakeholders, safety measures are emphasized by consumers and farmers, and education expenditure is considered important by farmers. The gender wage gap receives little attention, especially from consumers and policymakers, and health expenditures are seen as less relevant. *General comments:* Economic viability is regarded as the cornerstone of sustainability, and there is less focus on social factors due to limited awareness of supply chain and labour issues.

Netherlands

Environmental indicators: Environmental sustainability is considered the most important pillar by all Dutch stakeholders, with toxicological risks ranked especially high. *Economic indicators:* Stakeholders prioritize economic returns and tend to favour market-based viability and self-sufficiency over reliance on subsidies or external support. *Social indicators:* Labour rights and working conditions are identified as the most critical social dimensions, while overall social sustainability receives comparatively less attention. *General comments:* Dutch stakeholders clearly value environmental and economic sustainability, with relatively less focus placed on the social dimension.

Spain

Environmental indicators: Global warming and ecotoxicity are seen as the most pressing environmental issues by Spanish stakeholders, while fossil fuel depletion and ozone depletion are considered least important, particularly among farmers, consumers, and advisors. *Economic indicators:* The most valued economic metrics are production yield and net profit, especially among farmers, whereas subsidy dependence is considered relatively unimportant. *Social indicators:* Fair income and safe working conditions are top priorities across all stakeholder groups. Health expenditure is not a priority for farmers but is emphasized by advisors and consumers. *General comments:* Economic sustainability is the dominant concern, particularly among farmers, while environmental sustainability is ranked lower overall. Advisors, however, continue to emphasize environmental preservation and long-term sustainability.

Denmark

Environmental indicators: Global warming is regarded as the most important environmental concern across all stakeholder groups. Environmental sustainability more broadly is prioritized by suppliers and advisors. *Economic indicators:* Farmers and retailers focus strongly on production yield, while advisors and suppliers consider net profit especially important. Economic sustainability remains a key consideration for producers and retailers. *Social indicators:* Fair income and safe working conditions are universally regarded as important, and there is shared support for promoting social responsibility.

General comments: While environmental issues are acknowledged, particularly by advisors and suppliers, economic considerations are central for farmers and retailers.

Germany

Environmental indicators: Global warming is widely acknowledged, especially by advisors and farmers. Land use is rated highly by advisors and farmer organizations. Freshwater eutrophication is considered important by organizations but not by farmers, and terrestrial acidification is largely ignored. Water consumption receives moderate attention, mainly from the agri-food sector, while fossil fuel depletion and ozone formation are considered by farmers with low to moderate priority. *Economic indicators:* Farmers and the agri-food sector prioritize production yield, while advisors and organizations place less value on it. Subsidy dependence and revenue are generally seen as low-priority indicators. Net profit is the most valued metric, particularly among organizations and the agri-food sector, and operating and capital expenditures receive little attention. *Social indicators:* Fair income is prioritized by farmers and advisors but less so by industry and organizations. Health and safety indicators receive low to moderate emphasis, education is emphasized by advisors and moderately by farmers, and the gender wage gap gets moderate attention, primarily from farmers and advisors. Social responsibility is moderately valued, especially by farmer organizations. *General comments:* Stakeholders show distinct preferences—farmers prioritize economics, advisors focus on environmental sustainability, and farmer organizations seek a balanced approach. The agri-food sector emphasizes economic goals over social and environmental concerns.

6.3 Fairness framework validation

The fairness framework session offered a critical opportunity for stakeholders across the Use Cases to reflect on and evaluate fairness in agri-food value chains, laying a strong foundation for the development of fair business models. The discussions and survey findings revealed clear, cross-cutting priorities: equitable distribution of earnings, elimination of unfair trading practices, transparent and high-quality information sharing, and the fostering of trust-based relationships across the chain.

In Lithuania, stakeholders emphasized the importance of transparency, honest communication, and equal treatment, with particular focus on earnings fairness. Farmers reported relative satisfaction with income, while also calling for improved procedural justice and more inclusive engagement. Informational fairness — especially the quality and accuracy of shared data — and interpersonal fairness through stronger social ties were also seen as essential to resilience and collaboration.

In the Netherlands, participants highlighted the urgent need for fair profit and risk distribution, particularly in light of growers bearing the costs of climate-smart practices alone. Procedural fairness was closely tied to market behaviour, with calls for fixed compensation and stronger monitoring mechanisms. There was strong support for deeper collaboration and data sharing, though concerns remained about how information is used and whether retailers are willing to support system-wide certification and labelling efforts.

The Danish discussion reinforced the need for standardized definitions of sustainability. Without a shared understanding, it becomes difficult for farmers and other actors to meet expectations or for innovation to progress meaningfully. This echoes earlier findings from other countries: fairness in sustainability requires clarity, consistency, and mutual accountability.

The Spanish stakeholders generally recognized the importance of procedural consistency, communication quality, and interpersonal respect. However, the perception of earnings

and equity differs among stakeholder groups. For instance, farmers' perception of fairness in practice was generally negative while that of other stakeholders such as processors and traders was generally positive.

In the case for Germany, most stakeholders, including processors/traders and farmers generally perceived distributional fairness positively. However, others expressed dissatisfaction with payments and raised concerns regarding inequity in the value chain. There is a perceived lack of consideration and inclusion, particularly among farmers which is an indication of neglect or diminished trust and respect in interactions. The importance of clarity in communication is emphasized mainly by processors and traders.

Overall, the session revealed both common ground and context-specific insights. While priorities varied slightly between regions, a shared emphasis on economic justice, procedural clarity, and trustworthy information emerged. These results affirm that fairness is not just a normative goal but a functional necessity for enabling climate-smart transitions in agriculture. To ensure lasting impact, future business models must integrate these dimensions holistically, balancing structural reforms with human-centred practices that build trust, transparency, and shared responsibility across the entire value chain.

6.4 Validation of fair business model prototypes

The validation of business model prototypes across the BEATLES Use Cases revealed broad stakeholder support for approaches emphasizing transparency, shared responsibility, and collaborative innovation. However, common barriers—such as funding limitations, cultural resistance, certification complexities, and unclear governance—persist across contexts. Effective future implementation will require education, stronger alignment among stakeholders, phased development, and consistent monitoring.

In **Lithuania**, four prototypes were evaluated. Challenges revolved around limited funding, insufficient expertise, and equipment constraints. While models like *Open-Source for CSA* and *Peer-to-Peer Knowledge Sharing* were positively received, stakeholders emphasized the need for practical support, expert involvement, and improved digital literacy. *Transparency Branding* and *Consumer Engagement Platform* were also welcomed, though concerns about greenwashing, consumer trust, and resource availability were significant.

In the **Netherlands**, structured assessments revealed that while all four prototypes had potential, scalability beyond niche applications was questionable. *Pay-for-Success* and *Outcomes-Based Pricing* drew scepticism due to outcome measurement challenges, while *Retail Choice Editing* faced transparency and administrative hurdles. *Risk-Sharing Fund* stood out as a needed solution but raised concerns about governance and misuse.

Denmark focused on practicality and risk-sharing. *Pay-for-Success* was considered viable with institutional backing but raised red flags about narrow sustainability metrics. *Risk-Sharing Fund* was highly relevant, but stakeholders stressed the need for retailer engagement and clarity around coverage. *Retail Choice Editing* faced issues of consumer confusion, financial feasibility, and weak ESG tools, suggesting a phased and standardized approach is needed.

In **Spain**, three prototypes were discussed with a focus on the apple value chain. *Peer-to-Peer Knowledge Sharing* was especially promising, seen as a way to engage youth and share expertise. *Crowd-Farming* offered potential for direct market access but required consumer education and logistical refinement. *Shared Resource Pool* was seen as theoretically strong but hampered by cultural and operational concerns.

In **Germany**, four models were assessed. *Pay-for-Success* and *Bio-Districts* were conceptually supported but challenged by measurement difficulties and the need for political will. *Consumer-Driven Pricing* was well received with no major issues. *Data Coopetition Networks* offered transparency benefits but were hindered by data privacy concerns and platform fatigue.

Overall, while the business model prototypes show strong potential, realizing their benefits will depend on addressing local implementation barriers and fostering sustained stakeholder collaboration.

6.5 Next steps

There will be one more CCW within the BEATLES project in 2026. It will be important for BEATLES to produce a set of recommendations regarding the development of CSA within the EU. That CSA has yet to become a central climate change adaptation platform within EU agriculture and identified as such has a lot to do with attitudes of producers, retailers, consumers, and policymakers at EU and national levels. So, the one year remaining within the project will attempt to further intensify the CSA dialogue within the Use Case value chains with the aim of making some concrete recommendations within the BEATLES project.

For the 2026 CCWs it is suggested that we draft and discuss practical technical and policy recommendations regarding the application of CSAs within each of the BEATLES Use Cases including perspectives gained from the previous 3 sets of CCWs. Planning and agenda creation for the final CCWs needs to be carried out starting at the July consortium meeting in Spain and finalized well before the end of 2025.

7 APPENDICES

7.1 WP3 sustainability framework validation

Survey results

	Stakeholder identity	Overall priority (%)			Environmental indicators										Economic indicators					Social indicators								
		Env	Economic	Social	Global warming	Terrestrial acidification	Freshwater eutrophication	Land use	water consumption	fossil fuel depletion	ozone formation	Ecotoxicity	Terrestrial ecotoxicity	Freshwater ecotoxicity	Carcinogenic human toxicity	Non-carcinogenic human	production yield	subsidy dependence	revenues	net profit	OPEX	CAPEX	Fair income	Health expenditures	Safety measures	Education expenditures	Gender wage gap	Promote social responsibility
Lithuania	Farmer avg (n=5)	29	40	31	2.4	3.2	2.2	2.8	2	2.4	2	3.8					3.6	2.4	2.8	4.8	2.4	2.6	4.8	3	4.4	3.6	2.2	3.4
	Farmer ranges	25-35	35-50	30-35	4	3-5	3-5	4-5	2-4	4	3-4	4-5					3-5	4	4-5	4-5	3-5	4-5	4-5	5	3-5	4-5	3-4	3-5
	Policy maker/advisor avg (n=5)	32.5	35	32.5	2.2	2.2	1.4	3.6	1.8	2	1	3.6					3.6	2.8	1.8	4.8	2.8	2.8	5	1.8	2.4	2.6	1.8	3.4
	Policy maker/advisor ranges	20-40	33-45	30-35	1-5	3-5	3-4	2-5	1-4	2-5	1-4	4-5					4-5	3-5	4-5	4-5	4-5	4-5	5	1-5	4	4-5	1-5	3-5
	Consumer avg (n=2)	35	35	30	3.3	2.7	1	2.7	2.7	3	1	3					2.3	2.7	1.3	5	3	3	3.3	1.7	4.7	2.3	2.3	3
	Consumer ranges	30-40	30-40	30	5	4	-	4	4	4-5	3	4-5					3-4	4	4	5	4-5	4-5	5	5	4-5	2-5	3-4	3

	Stakeholder identity	Overall priority (%)			Environmental indicators											Economic indicators					Social indicators						
		Env	Economic	Social	Global warming	Terrestrial acidification	Freshwater eutrophication	Land use	water consumption	fossil fuel depletion	ozone formation	Ecotoxicity	Terrestrial ecotoxicity	Freshwater ecotoxicity	Carcinogenic human toxicity	Non-carcinogenic human	production yield	subsidy dependence	revenues	net profit	OPEX	CAPEX	Fair income	Health expenditures	Safety measures	Education expenditures	Gender wage gap
Germany	Farmer avg (n=4)	33.5	38.3	28.3	3.3	0.3	0.8	2.8	2.3	2.8	2.3	-				4.5	2.3	1.8	2.5	2.5	0.8	4.8	2.8	1	3.3	2.3	2.5
	Farmer ranges	20-40	30-50	20-33	3-5	1	3	3-4	2-5	3-5	4-5	-				4-5	1-5	3-4	5	3-4	3	4-5	3-5	4	3-5	4-5	3-4
	Advisor avg (n=3)	55	25	18.3	5	-	1.3	5	2.7	-	-	-				3	1	1.3	3.3	1.3	1.3	4.3	1	-	5	3	2.7
	Advisor ranges (n=3)	50-60	20-30	10-25	5	-	4	5	4	-	-	-				1-4	3	4	5	4	4	4-5	3	-	5	4-5	4
	Farm org avg (n=2)	30	40	30	2.5	-	4.5	4.5	2	-	-	-				1.5	-	1.5	5	-	3	2	1.5	2	2.5	-	4
	Farm org ranges (n=2)	20-40	30-50	30	5	-	4-5	4-5	4	-	-	-				3	-	3	5	-	3	4	3	4	5	-	3-5
	Agri-food industry avg (n=2)	22.5	55	22.5	1.5	-	2	4.5	4.5	-	-	-				4.5	2	-	5	-	2	2	2	2.5	4	-	2

	Stakeholder identity	Overall priority (%)			Environmental indicators										Economic indicators					Social indicators								
		Env	Economic	Social	Global warming	Terrestrial acidification	Freshwater eutrophication	Land use	water consumption	fossil fuel depletion	ozone formation	Ecotoxicity	Terrestrial ecotoxicity	Freshwater ecotoxicity	Carcinogenic human toxicity	Non-carcinogenic human	production yield	subsidy dependence	revenues	net profit	OPEX	CAPEX	Fair income	Health expenditures	Safety measures	Education expenditures	Gender wage gap	Promote social responsibility
	Agri-food industry range (n=2)	20-25	50-60	20-25	3	-	4	4-5	4-5	-	-	-				4-5	4	-	5	-	4	4	4	4	5	3-5	-	4
Netherlands	Average of responses	50	35	15	3.1	2.7	2.9	-	1.7				3.3	3.5	4.0	3.1	3.5	1.5	4.2	4.7	2.9	3.1	4.8	-	4.5	-	-	-
Denmark	Farmer avg	30	40	30	3	4	-	-	-	3	-	-				5	-	4	-	4	-	3	3	-	-	-	4	
	Farmer ranges (n=1)	30	40	30	3	4	-	-	-	3	-	-				5	-	4	-	4	-	3	3	-	-	-	4	
	Advisor	46.7	30	23.3	4.7	1.7	3.7	-	4	2	1	-				2.7	2.3	3.3	5.0	3.3	3.3	3.3	2.7	4.3	2.3	2.7	5.0	
	Advisor ranges (n=3)	30-60	20-45	20-25	4-5	2-3	2-5	-	2-5	2-3	1-2	-				3-5	2-5	5	5	2-5	2-5	3-4	3-5	4-5	2-5	3-5	5	
	Farm org	36.7	33.3	30	4.3	2	2.7	-	2.7	1.3	4.3	-				2.0	3.0	4.5	2.0	2.0	1.5	5	4	4	3	4	5	

	Stakeholder identity	Overall priority (%)			Environmental indicators										Economic indicators					Social indicators										
		Env	Economic	Social	Global warming	Terrestrial acidification	Freshwater eutrophication	Land use	water consumption	fossil fuel depletion	ozone formation	Ecotoxicity	Terrestrial ecotoxicity	Freshwater ecotoxicity	Carcinogenic human toxicity	Non-carcinogenic human	production yield	subsidy dependence	revenues	net profit	OPEX	CAPEX	Fair income	Health expenditures	Safety measures	Education expenditures	Gender wage gap	Promote social responsibility		
Farm org ranges (n=3)		30-50	20-40	30	4-5	3	4	-	4	2	4-5	-						2	3	4-5	4	4	3	5	4	4	3	4	5	
	Supplier	69.5	20	10.5	4	2	2.5	-	1.5	2.5	-	-						-	2	3	5	5	4	3.5	2.0	4.0	-	-	2.0	
	Supplier ranges (n=2)	60-79	20	1-20	4	4	5	-	3	5	-	-						-	1.0	1.5	5.0	2.5	2.0	3-4	4	4	-	-	4	
	Retailer	40	40	20	4	3	3	-	3	3	4	-						4	4	2	3	3	3	3	3	3	4	4		4
	Retailer ranges (n=1)	40	40	20	4	3	3	-	3	3	4	-						4	4	2	3	3	3	3	3	3	4	4		4
Spain	Farmer avg (n=4)	27.5	41.3	31.2	4	1.5	1.8	4.8	4	1.8	1.8	2.3						4	1.5	3.5	4	2.3	2.3	4.3	1.5	3.5	2.3	1.8	3	
	Farmer ranges	25-30	25-50	25-50	2-5	1-5	3-5	4-5	3-5	2-5	2-5	4-5						2-5	1-3	3-4	3-5	2-4	2-4	2-5	2-4	2-5	4-5	2-5	1-4	
	Advisor (n=1)	50	25	25	5	2	4	5	3	5	3	5						2	2	3	4	4	4	4	5	4	2	5	5	
	Farm organization avg	40	30	30	4	3	4.3	4.3	4	3.3	3.3	5						4.7	3.7	4	4.7	4	3.7	5	3.3	3.7	3.7	4.3	4.3	

Table 6. Balancing the three pillars of sustainability within each of the Use Cases

	Environmental indicators	Economic indicators	Social indicators	Comments
Lithuania	<ul style="list-style-type: none"> -Global warming is considered moderately important by all stakeholders -All stakeholders place less emphasis on terrestrial acidification -Low importance given to freshwater eutrophication by all stakeholders -Ecotoxicity was one of the most significant effects due to the potential impact of fertilizers, pesticides, and other chemicals on human and environment all health 	<ul style="list-style-type: none"> -Strong focus on financial viability and productivity -Stakeholders acknowledge the trade-off between increased yield and environmental sustainability -Subsidies considered as a means of assistance rather than as a key component of sustainability -Net profit considered the most significant economic indicator 	<ul style="list-style-type: none"> -Fair income considered important by all stakeholders -Health expenditures considered less important by all stakeholders -Safety measures considered important by consumers and farmers -Farmers consider education expenditure important -Gender wage gap received low ratings from consumers and policymakers 	<ul style="list-style-type: none"> -Economic aspects are prioritized by farmers in particular -Economic viability considered a foundation for sustainable practices -Less emphasis on social factors due to lack of awareness of supply chain impacts on communities or labour rights
The Netherlands	<ul style="list-style-type: none"> -Toxicological risks considered most important by most stakeholders 	<ul style="list-style-type: none"> -Economic returns considered more important by stakeholders -Stakeholder preference for market-based viability and self-sufficiency 	<ul style="list-style-type: none"> -Labour rights and working conditions considered most important by stakeholders 	<ul style="list-style-type: none"> -Environmental sustainability considered most important by all stakeholders -Social sustainability considered less important

	Environmental indicators	Economic indicators	Social indicators	Comments
Spain	<ul style="list-style-type: none"> -Global warming and ecotoxicity are considered most important by stakeholders -Fossil fuel depletion and ozone depletion are considered least important by stakeholders (mainly farmers, consumers, and advisors) 	<ul style="list-style-type: none"> -Production yield and net profit are considered most important by the majority of stakeholders, particularly farmers -Dependence on subsidy considered least important 	<ul style="list-style-type: none"> -Fair income and safe working conditions are considered most important by all stakeholder groups -Health expenditure is not considered a priority by farmers while advisors and consumers consider this a priority 	<ul style="list-style-type: none"> -High importance is given to economic sustainability, particularly by farmers -Environmental sustainability is considered least important -Environmental preservation and long-term sustainability are the focus areas of advisors
Denmark	<ul style="list-style-type: none"> - Global warming is considered most important by all stakeholders 	<ul style="list-style-type: none"> - Production yield is considered important by farmers and retailers - Net profit was also considered important, mainly by advisors and suppliers 	<ul style="list-style-type: none"> - Fair income and safe working conditions are considered most important by all stakeholder groups - The promotion of social responsibility was considered a priority area to focus on by all stakeholders 	<ul style="list-style-type: none"> - Environmental sustainability considered most important, mainly by suppliers and advisors - Farmers and retailers prioritize the economic sustainability

	Environmental indicators	Economic indicators	Social indicators	Comments
Germany	<ul style="list-style-type: none"> -Global warming is widely recognized, especially by advisors and farmers. -Land use is also rated highly by advisors and farmer organizations. -Freshwater eutrophication scores high with organizations, but low with farmers. -Terrestrial acidification is largely overlooked. -Water consumption gets moderate scores, highest from the agri-food sector -Fossil fuel depletion and ozone formation are rated only by farmers, with low to moderate importance. 	<ul style="list-style-type: none"> -Farmers and the agri-food sector value production yield while advisors and organizations rate it lower. -Subsidy dependence and revenues are rated low across the board. -Net profit is the most valued metric, especially by organizations and the agri-food sector. -OpEx and CapEx receive limited attention, especially from farmers. 	<ul style="list-style-type: none"> -Fair income is valued by farmers and advisors but less by industry and organizations. -Health and safety get low to moderate ratings. -Education is prioritized by advisors and moderately by farmers. -The gender wage gap received moderate attention, primarily from farmers and advisors. -Social responsibility is moderately valued, highest by farmer organizations, but less so by the agri-food sector. 	<ul style="list-style-type: none"> -Stakeholders differ in their prioritization: farmers focus on the economic pillar, advisors on the environmental, and farmer organizations show balance. -The agri-food sector emphasizes economics over social and environmental concerns.

7.2 WP4 survey about fairness norms in the Use Cases

In WP4.2, a collection of business practices has been developed that are found to increase fairness perceptions of business actors. What is considered fair depends on a lot of factors, including the business context and institutional context, and personal norms and beliefs. With this short survey we intend to test a number of findings from our research on **fairness norms and perceptions in business relations**.

DENMARK	Stakeholder category									
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)	avg	range	avg	range	avg	range	avg	range	avg	range
What are your norms?										
Distributional fairness:	4,0	2-5	3,3	1-5	4,7	4-5			4,3	3-5
That you are paid according to your efforts and investments	5,0	5-5	5,0	5-5	5,0	5-5			4,5	4-5
That you are paid the same as your supply chain partner	2,5	2-3	1,0	1-1	5,0	5-5			4,0	3-5
That you are paid at least enough to cover your costs	4,5	4-5	4,0	4-4	4,0	4-4			4,5	4-5
Procedural fairness:	4,1	2-5	5,0	5-5	4,0	4-4			4,2	3-5
That supply chain procedures are always followed in the same way	4,0	4-4			4,0	4-4			4,0	4-4
That supply chain procedures are applied to everyone in the same way	3,5	2-5	5,0	5-5	4,0	4-4			4,5	4-5
That the information that is provided to you for supply chain procedures is always correct	4,0	4-4	5,0	5-5	4,0	4-4			4,5	4-5
That mistakes in procedures can be challenged and corrected	4,0	4-4	5,0	5-5	4,0	4-4			4,5	4-5
That my specific interests and position is addressed in the procedures	4,0	3-5			4,0	4-4			3,5	3-4
That the procedures respect my rights	5,0	5-5			4,0	4-4			4,0	4-4
Informational fairness:	4,0	3-5	5,0	5-5	4,3	4-5			4,5	4-5
That the communication in the chain is honest	4,5	4-5	5,0	5-5	5,0	5-5			4,5	4-5
That your supply chain partner is giving you thorough, reasonable and timely explanation when something goes wrong	4,0	4-4	5,0	5-5	4,0	4-4			4,5	4-5

DENMARK	Stakeholder category									
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)										
That the information that your supply chain partner gives is understandable	3,5	3-4	5,0	5-5	4,0	4-4			4,5	4-5
Interpersonal fairness:	4,5	4-5	2,0	2-2	4,0	4-4			3,5	3-4
That your supply chain partner treats you with respect, dignity and politeness	4,5	4-5	2,0	2-2	4,0	4-4			3,5	3-4
What is fair?										
Your earnings	3,5	3-4	4	4-4	4	4-4			4	4-4
The earnings of the supply chain partners	2,5	1-4			4	4-4			3	3-3
The business procedures in your supply chain	4,5	4-5			4	4-4				
The communication and information exchange in your supply chain	4	3-5	3	3-3					3	3-3
The way you are treated by supply chain partners in interpersonal contact	3,5	3-4	4	4-4					3	3-3

GERMANY	Stakeholder category											
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder		Unknown	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)												
What are your norms?	avg	range	avg	range	avg	range	avg	range	avg	range	avg	range
Distributional fairness:	4,3	2-5			4,6	3-5			3,8	1-5	4,7	4-5
That you are paid according to your efforts and investments	4,3	3-5			5,0	5-5			4,3	3-5	5,0	5-5
That you are paid the same as your supply chain partner	4,5	4-5			4,0	3-5			2,3	1-3	4,0	4-4
That you are paid at least enough to cover your costs	4,3	2-5			4,7	4-5			4,7	4-5	5,0	5-5
Procedural fairness:	3,6	1-5			3,8	3-5			3,6	1-5	4,2	4-5
That supply chain procedures are always followed in the same way	3,3	2-4			3,3	3-4			2,3	1-3	4,0	4-4
That supply chain procedures are applied to everyone in the same way	3,5	3-4			3,7	3-4			3,3	2-4	5,0	5-5

GERMANY	Stakeholder category											
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder		Unknown	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)												
That the information that is provided to you for supply chain procedures is always correct	4,3	4-5			4,0	3-5			4,3	4-5	4,0	4-4
That mistakes in procedures can be challenged and corrected	4,0	3-5			4,0	4-4			4,3	4-5	4,0	4-4
That my specific interests and position is addressed in the procedures	3,0	1-4			3,7	3-5			3,3	3-4	4,0	4-4
That the procedures respect my rights	3,8	2-5			4,0	4-4			3,7	2-5	4,0	4-4
Informational fairness:	4,2	3-5			4,3	3-5			4,2	3-5	5,0	5-5
That the communication in the chain is honest	4,5	4-5			4,7	4-5			4,3	4-5	5,0	5-5
That your supply chain partner is giving you thorough, reasonable and timely explanation when something goes wrong	4,5	4-5			4,0	3-5			4,0	3-5	5,0	5-5
That the information that your supply chain partner gives is understandable	3,5	3-4			4,3	4-5			4,3	4-5	5,0	5-5
Interpersonal fairness:	3,5	3-4			4,7	4-5			4,3	3-5	5,0	5-5
That your supply chain partner treats you with respect, dignity and politeness	3,5	3-4			4,7	4-5			4,3	3-5	5,0	5-5
What is fair?												
Your earnings	3,7	3-4			3,3	3-4			3,0	3-3	4,0	4-4
The earnings of the supply chain partners	3,3	3-4			3,3	3-4			3,0	3-3	3,5	3,5-3,5
The business procedures in your supply chain	4,0	3-5			3,3	3-4			3,0	3-3	3,5	3,5-3,5
The communication and information exchange in your supply chain	4,5	3-5			3,7	3-4			3,0	3-3	3,5	3,5-3,5
The way you are treated by supply chain partners in interpersonal contact	3,8	3-5			3,3	3-4			3,0	3-3	3,5	3,5-3,5

LITHUANIA	Stakeholder category									
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)	avg	range	avg	range	avg	range	avg	range	avg	range
What are your norms?										
Distributional fairness:	4,3	1-5	4,3	3-5					4,5	2-5
That you are paid according to your efforts and investments	4,4	4-5	5,0	5-5					4,2	2-5
That you are paid the same as your supply chain partner	4,6	3-5	5,0	5-5					4,5	4-5
That you are paid at least enough to cover your costs	4,0	1-5	3,0	3-3					5,0	5-5
Procedural fairness:	4,3	3-5	3,7	3-5					4,5	3-5
That supply chain procedures are always followed in the same way	4,0	3-5		4-4					4,2	3-5
That supply chain procedures are applied to everyone in the same way	4,8	4-5	3,0	3-3					4,3	3-5
That the information that is provided to you for supply chain procedures is always correct	4,2	3-5	3,0	3-3					4,8	4-5
That mistakes in procedures can be challenged and corrected	4,8	4-5	5,0	5-5					5,0	5-5
That my specific interests and position is addressed in the procedures	4,0	3-5		3-3					4,5	4-5
That the procedures respect my rights	4,2	4-5		4-4					4,3	3-5
Informational fairness:	4,5	3-5	4,3	4-5					4,7	3-5
That the communication in the chain is honest	4,2	3-5	4,0	4-4					4,7	3-5
That your supply chain partner is giving you thorough, reasonable and timely explanation when something goes wrong	4,6	4-5	4,0	4-4					4,7	4-5
That the information that your supply chain partner gives is understandable	4,6	4-5	5,0	5-5					4,8	4-5
Interpersonal fairness:	4,8	4-5	5,0	5-5					4,3	3-5
That your supply chain partner treats you with respect, dignity and politeness	4,8	4-5	5,0	5-5					4,3	3-5
What is fair?										
Your earnings	4,2	4-5	4,0	4-4					3,3	2-5
The earnings of the supply chain partners	3,2	3-4	4,0	4-4					4,0	3-5
The business procedures in your supply chain	3,8	3-5	4,0	4-4					4,5	4-5
The communication and information exchange in your supply chain	4,0	3-5	4,0	4-4					4,3	4-5

LITHUANIA	Stakeholder category											
	ranking results from 1 to 5 in terms of level of importance/fairness (average and range)		Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder	
The way you are treated by supply chain partners in interpersonal contact	3,8	3-5	5,0	5-5							4,3	3-5

NETHERLANDS	Stakeholder category												
	ranking results from 1 to 5 in terms of level of importance/fairness (average and range)		Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder		Farmers/traders mixed activities
What are your norms?	avg	range	avg	range	avg	range	avg	range	avg	range	avg	range	
Distributional fairness:	4,5	2-5			4,3	3-5			4,5	3-5	3,5	1-5	
That you are paid according to your efforts and investments	5,0	5-5			4,7	4-5			5,0	5-5	5,0	5-5	
That you are paid the same as your supply chain partner	3,4	2-5			3,3	3-4			3,5	3-4	2,5	1-4	
That you are paid at least enough to cover your costs	5,0	5-5			5,0	5-5			5,0	5-5	3,0	1-5	
Procedural fairness:	4,4	3-5			4,2	4-5			4,3	4-5	4,8	3-5	
That supply chain procedures are always followed in the same way	4,5	4-5			4,0	4-4			4,0	4-4	4,0	3-5	
That supply chain procedures are applied to everyone in the same way	4,0	3-5			4,0	4-4			4,5	4-5	5,0	5-5	
That the information that is provided to you for supply chain procedures is always correct	4,5	4-5			4,3	4-5			4,0	4-4	5,0	5-5	
That mistakes in procedures can be challenged and corrected	4,5	4-5			4,0	4-4			4,5	4-5	5,0	5-5	
That my specific interests and position is addressed in the procedures	4,2	4-5			4,3	4-5			4,5	4-5	4,5	4-5	
That the procedures respect my rights	4,7	4-5			4,7	4-5			4,5	4-5	5,0	5-5	
Informational fairness:	4,5	3-5			4,2	4-5			4,8	4-5	4,7	4-5	
That the communication in the chain is honest	4,3	3-5			4,3	4-5			5,0	5-5	5,0	5-5	
That your supply chain partner is giving you thorough, reasonable and timely explanation when something goes wrong	4,6	4-5			4,0	4-4			4,5	4-5	4,5	4-5	

NETHERLANDS	Stakeholder category											
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder		Farmers/traders mixed activities	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)												
That the information that your supply chain partner gives is understandable	4,5	4-5			4,3	4-5			5,0	5-5	4,5	4-5
Interpersonal fairness:	4,3	4-5			4,3	4-5			4,5	4-5	5,0	5-5
That your supply chain partner treats you with respect, dignity and politeness	4,3	4-5			4,3	4-5			4,5	4-5	5,0	5-5
What is fair?												
Your earnings	2,3	2-3			4,3	4-5			3,5	2-5	5,0	5-5
The earnings of the supply chain partners	2,2	2-3			3,7	3-4			3,0	2-4	5,0	5-5
The business procedures in your supply chain	2,3	2-3			3,3	3-4			3,5	3-4	4,0	3-5
The communication and information exchange in your supply chain	2,7	1-4			4,0	4-4			3,5	3-4	4,5	4-5
The way you are treated by supply chain partners in interpersonal contact	2,8	2-4			4,0	4-4			3,5	2-5	4,0	3-5

SPAIN	Stakeholder category										
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder		
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)											
What are your norms?	avg	range	avg	range	avg	range	avg	range	avg	range	
Distributional fairness:	4,2	2-5			4,0	3-5	4,7	3-5	4,3	4-5	
That you are paid according to your efforts and investments	4,6	4-5			4,5	4-5	5,0	5-5	4,5	4-5	
That you are paid the same as your supply chain partner	3,3	2-4			3,0	3-3	4,0	3-5	4,0	4-4	
That you are paid at least enough to cover your costs	4,5	3-5			4,5	4-5	5,0	5-5	4,5	4-5	
Procedural fairness:	4,1	2-5			4,6	4-5	4,2	3-5	4,2	3-5	
That supply chain procedures are always followed in the same way	3,0	2-5			4,0	4-4	4,0	3-5	3,5	3-4	
That supply chain procedures are applied to everyone in the same way	4,0	3-5			4,0	4-4	4,5	4-5	4,5	4-5	
That the information that is provided to you for supply chain procedures is always correct	4,0	2-5			4,5	4-5	3,5	3-4	4,0	4-4	

SPAIN	Stakeholder category									
	Farmer		Input supplier		Processors / trader		Retailer		Other stakeholder	
ranking results from 1 to 5 in terms of level of importance/fairness (average and range)										
That mistakes in procedures can be challenged and corrected	4,1	2-5			5,0	5-5	4,0	4-4	4,0	4-4
That my specific interests and position is addressed in the procedures	4,3	4-5			4,5	4-5	4,0	4-4	4,0	4-4
That the procedures respect my rights	4,9	4-5			5,0	5-5	5,0	5-5	5,0	5-5
Informational fairness:	4,5	3-5			4,5	4-5	4,3	3-5	4,0	3-5
That the communication in the chain is honest	4,4	3-5			4,0	4-4	5,0	5-5	4,5	4-5
That your supply chain partner is giving you thorough, reasonable and timely explanation when something goes wrong	4,4	3-5			4,5	4-5	4,5	4-5	4,0	4-4
That the information that your supply chain partner gives is understandable	4,5	3-5			5,0	5-5	3,5	3-4	3,5	3-4
Interpersonal fairness:	5,0	5-5			5,0	5-5	5,0	5-5	5,0	5-5
That your supply chain partner treats you with respect, dignity and politeness	5,0	5-5			5,0	5-5	5,0	5-5	5,0	5-5
What is fair?										
Your earnings	2,3	1-3			4,0	4-4	2,5	2-3	3,5	3-4
The earnings of the supply chain partners	2,3	1-3			3,5	3-4	3,0	2-4	3,5	3-4
The business procedures in your supply chain	2,1	1-3			3,5	3-4	3,5	3-4	4,0	4-4
The communication and information exchange in your supply chain	2,7	2-4			3,5	3-4	4,0	4-4	4,0	4-4
The way you are treated by supply chain partners in interpersonal contact	2,7	1-4			4,5	4-5	3,5	3-4	4,5	4-5

7.3 WP4 results of the validation exercise on fair business models

7.3.1 Introduction

Each of the Use Cases were asked to choose 3 or 4 of the 13 business model prototypes provided by WP4 to validate. This resulted in the following array (Table 7). Following Table 7, the justification for selecting the fair business model prototypes is outlined including the importance of the selected prototypes for the various food value chains, implementation of the selected prototypes in the various Use Case value chains, and the potential contribution of the selected prototypes in the transition to CSA in the various Use Case value chains.

Table 7. Fair business model prototypes chosen by the BEATLES Use Cases for validation during the 2025 Co-Creation Workshops

Fair BM Prototypes	Use Case				
	FBDC	Delphy	Naturland	INTIA	AFL
1. Pay for success	X	X	X		
2. Crowd-farming				X	
3. Consumer-driven pricing			X		
4. Risk-sharing fund	X	X			
5. Bio-districts			X		
6. Retail-choice editing	X	X			
Hi 7. Open source					X
8. Outcomes-based pricing		X			
9. Shared resource pool				X	
10. Transparency branding					X
11. Consumer engagement platform					X
12. Peer to peer knowledge sharing				X	X
13. Data coopetition network			X		

Use Case Germany

Pay for success: This prototype is important for the Use Case because it uses an approach not common in organic agriculture- to pay for the outcome rather than the practices implemented. It has advantages and disadvantages for farmers and the supply chain, which is why it was interesting to discuss the potential. In the sector, there are many debates nowadays about the compensation models for farmers – with the dairy sector being most advanced in Germany regarding the climate discussion. Discussing this prototype helped participants to raise awareness on differences in payment schemes for CSA practices. The prototype is not implemented yet but there are payments within the

CAP that are bound to outcomes rather than practices implemented, so the logic was not new to the participants.

Consumer-driven pricing: Consume-driven pricing initiatives exist in Germany but none of the participants had experience with it. Given that in recent CCWs, consumers and their choice were identified as a major barrier to adoption of CSA, this prototype was considered interesting for participants to discuss potential options to include consumers and raise awareness.

Bio-District: Within the Use Case, a bio-district exists. In Germany it is called “Öko-Model region”. The manager of the bio-district was also present in all the CCWs. In the region of the Use Case, the bio-district is well established and well connected. The bio-district is important for farmers, processors, and consumers as it aims to connect the value chain actors and provide support and information about organic agriculture.

Data competition network: This prototype was additionally chosen due to the fact that no other Use Case selected it. Nevertheless, the discussion around data protection is big in Germany and many farmers are reluctant when it comes to sharing data. This is why the discussion was interesting for farmers as well as learning about potential benefits of sharing data.

Use Case Spain

The prototypes were selected based on the diversity of interests among the stakeholders participating in the UC and in the workshop, trying to address all the different interests; some people more interested in machinery sharing, others in the platform of peer-to-peer knowledge.

All the prototypes aim to increase fairness in the value chain, which is linked to the transition to CSA. For instance, use of shared machinery could be beneficial in terms of environmental impact, economic expenses and social collaboration between neighbours. None of the selected prototypes are already being applied as described in the sheets. However, one farmer participated in the “**Crowdfarming**” initiative, and others have tried machinery sharing.

Use Case The Netherlands

The potato value chain relies heavily on stability in yield, quality and market demand, while at the same time seeking to become more sustainable. The chosen prototypes offer concrete answers to this:

Pay for Success makes it possible to reward farmers for measurable sustainability results such as soil health and emission reduction, which is in line with PlanetProof goals.

Risk-Sharing Fund could help farmers mitigate risks of lost income or additional costs due to the transition to more sustainable practices, crucial for trust in change within the chain.

Retail Choice Editing ensures that retailers actively choose sustainable potato products, creating a stable market for PlanetProof products and giving farmers more certainty.

Outcomes-Based Pricing provides access to technology without high upfront investments, linking payment to performance. This encourages efficiency and innovation in potato farming without additional financial risk.

The four prototypes incentivise CSA through multiple mechanisms:

Pay for Success links financial rewards directly to climate-smart outcomes (e.g. carbon reduction, soil improvement), reinforcing sustainable behavioural change.

Risk-Sharing Fund lowers the risk for farmers to implement CSA practices, leading to wider adoption of climate-smart techniques.

Retail Choice Editing accelerates market demand for sustainably produced potatoes and makes CSA visible and attractive to both consumers and growers.

Outcomes-Based Pricing makes new CSA technologies readily available while increasing yield and efficiency, directly contributing to climate-smart production.

At the moment, none of the four chosen prototypes is fully implemented within PlanetProof potato cultivation. In some cases, buyers (such as retail or traders) offer a slightly higher price for PlanetProof-certified potatoes, but this varies greatly by contract and marketing channel. Often the benefit to the farmer is indirect: access to specific markets (e.g. supermarkets demanding PlanetProof) or maintaining marketing relationships.

Use Case Lithuania

These specific prototypes were selected based on Lithuania's position regarding the key aspects they represent. For example, in Lithuania, there is a notable lack of knowledge — both about CSA itself and about its implementation, including available funding opportunities. Prototypes related to knowledge sharing enabled stakeholders to share their views on how to address this knowledge gap through the prototypes, and to identify potential challenges for their implementation in Lithuania — what might work and what might not. This feedback offers a broader perspective on what should be avoided and prioritized in future project and non-project activities.

One of the selected prototypes already being implemented in Lithuania is Prototype 7: **Open-Source** for CSA, which is addressed through the HACK AgriFood Challenge Lab, organised by AgriFood Lithuania initiated by EIT Food. This business model prototype fosters open collaboration and co-creation across disciplines, enabling stakeholders to generate innovative, context-specific solutions and share knowledge in an accessible and inclusive format. Additionally, the prototypes also address engagement challenges, where insights from farmers themselves are crucial. Transparency emerged as another important aspect for all value chain participants, due to low trust in brands, labels, and authorities — an issue that stakeholders also highlighted.

Overall, the selected prototypes provide valuable insights into Lithuania's specific challenges and opportunities, helping to shape more effective and targeted strategies for future implementation.

Use Case Denmark

Pay for success: a similar model is applied for Danish dairy production where ARLA awards farmers for obtaining specific goal in a point system. <https://www.arla.com/sustainability/the-farms/arlal-sustainability-incentive-model-qa/>
<https://webinar.arlafoodsingredients.com/arla-incentive-model>

Inspired by this, it was interesting to discuss the chosen BM prototype for pig production. The Danish Crown is using a tool to pay farmers extra if they document their feed consumption and are certified. However, this approach is still not as successful as the ARLA model, and the climate tools available are still under development as well as documentation is in progress.

Risk sharing fund: Why the selected prototypes are important for your various food value chains – there idea may be beneficial from a cooperative perspective. However, funding for Danish agriculture is more/has been previously based on subsidies for implementing climate action that primarily focus on reducing greenhouse gas emissions based on the CAP interventions. These tools include improved manure management, biogasification of slurry, barn acidification, and other measures that can help minimize CO2 emissions but these subsidies are not available at present. The subsidies rely on the national legislation and focus, and hence changes. Therefore, a risk sharing fund is not as such relevant/has been used. Given the national subsidy scheme, the impression is that this prototype may be difficult in implement.

Retail editing: this prototype has been used previously to band selling egg from cage housed egg laying hens but has not been applied (as far as I know) in pig production. One of the main challenges within consumer and retail influence on production of 'climate

smart pig products/meat' or any other climate smart products, is that the farmer needs to plan his production on a long term basis (5, 10 + years) from a economic perspective and from a production planning perspective (including planning of crop production and/or feed supply/buy in) whereas retailers (and consumers) operate on a short term basis. If the product simply does not sell, the retail will take it out of the store. Retailers cannot/will not wait for consumers to be aware about the new and potential climate smart product. Therefore the most important thing in the very end is trust and willingness for retailers to believe and willingness to support new products. Communication from farmers to consumers VIA retailers are therefore essential.

Animal welfare for consumers is getting more important compared to climate smart production, even though nitrogen leakage and emissions from farms still is a high priority. The Danish Crown is using a tool to pay farmers extra if they document their feed consumption and are certified. However, this approach is still not as successful as the ARLA model.

'What follows are the reports provided by the Use Case lead organisations. The overall thinking, planning and training behind these sessions was generated by WP4. Further interpretation and synthesis of the validation results will be published in BEATLES Deliverable 4.4 by month 48 in mid-2026.

7.3.2 Lithuania business model validation

The prototypes were selected based on Lithuania's position regarding the key aspects they represent. For example, in Lithuania, there is a notable lack of knowledge — both about CSA and about its implementation, including available funding opportunities. Prototypes related to knowledge sharing enabled stakeholders to share their views on how to address knowledge gap through the prototypes, and to identify potential challenges for their implementation in Lithuania — what might work or not. This feedback offers a broader perspective on what should be avoided and prioritized in future project and non-project activities. One of the selected prototypes already being implemented in Lithuania is Open-Source for CSA, which is addressed through the HACK AgriFood Challenge Lab, organised by AgriFood Lithuania initiated by EIT Food. This business model prototype fosters open collaboration and co-creation across disciplines, enabling stakeholders to generate innovative, context-specific solutions and share knowledge in an accessible and inclusive format. Additionally, the prototypes also address engagement challenges, where insights from farmers themselves are crucial. Transparency emerged as another important aspect for all value chain participants, due to low trust in brands, labels, and authorities — an issue that stakeholders also highlighted. Overall, the selected prototypes provide valuable insights into Lithuania's specific challenges and opportunities, helping to shape more effective and targeted strategies for future implementation.

Three groups of stakeholders reviewed the same 4 prototypes providing an element of sample replication in the exercise. The key assumptions for each business model are listed only once for group 1 and not repeated.

GROUP 1

1. Business model prototype: 7. Open-Source for Climate-Smart Agriculture.

Key assumptions behind the prototype:

- Farmers participate in innovation and in testing new solutions: Farmers are often cautious about implementing untested solutions due to the risks involved such as potential crop losses or financial costs.

- Farmers share data and insights to drive solution development: Access to farm data (e.g. soil health, crop yields, input usage) is essential for designing and testing effective solutions. However, farmers may have privacy or competitive concerns.
- Cross-sector collaboration results in practical solutions that farmers can use. This model assumes that bringing together diverse expertise will produce practical, useful solutions that are tailored to real farming challenges.
- Sufficient funding and support can be secured for long-term operations: The ongoing success of the hub requires consistent funding and support to organize events, provide resources, and incentivize stakeholder participation.

Challenges on implementing the business model:

- Finances
- Shortage of qualified workers
- Lack of sustainable/conservation-oriented equipment
- Lack of knowledge/ Up-to-date information
- Lack of professional advice

Comments from the stakeholders:

- The first challenge is funding — without financial support, nothing can move forward. You can't even begin without resources (policy advisor).
- When it comes to collaboration, sharing data and knowledge is essential (All agreed). However, some farmers are hesitant to share information due to concerns about privacy and competition (policy advisor, consumer). Still, cooperation makes it much easier to achieve common goals (two policy advisors and consumer). In the context of sustainability, it's not enough to just share knowledge and data — there's also a responsibility to support others in the process.
- Many farmers' scepticism toward new technologies and practices stems from the difficulty of accessing or financing them (farmer, policy advisor). There's a persistent shortage of the latest sustainable technologies across various farming practices (farmer, policy advisor).
- With adequate funding, we can attract both skilled workers and modern technologies. But a major challenge is the lack of knowledge on how to access funding. Stronger cooperation among stakeholders could help involve more experts, but currently there's a shortage of specialists who know how to implement or develop sustainable farming solutions (consumer, two policy advisors and a farmer). Again, this links back to the financial aspect — funds are needed to attract and engage those experts (farmer).
- Another important point is participation: do farmers have time to engage in such platforms? It often depends on the seasonal workload and farming cycles, which vary throughout the year. (farmer, consumer)

2. Business model prototype: 10. Transparency Branding for Climate-Smart Agriculture.

Key assumptions behind the prototype:

- Consumers value and act on transparency information: Consumers value transparency about how products are made and are willing to base their purchasing decisions on clear information about climate-smart practices.
- Farmers share detailed data on production processes: Farmers are willing to track and share data on their environmental practices (e.g. emissions, water use) if it leads to better market access or financial rewards.
- Certification bodies provide credible verification: Farmers and consumers trust that certification bodies provide credible verification.

- Retailers highlight and promote transparency-branded products. Retailers see value in promoting transparency-branded products and are willing to provide shelf space or marketing support to align with consumer demand and sustainability goals.

Comment: Lack of consumer education regarding sustainably or organically produced goods and their labelling.

Challenges on implementing the business model:

- Lack of consumer education
- Education in educational institutions
- Low trust in supervisory authorities

Comments from the stakeholders:

- As consumers, we tend to have low trust in the institutions responsible for auditing and certifying the sustainability aspects of businesses, which makes it difficult to shape lasting consumer habits (consumer). While ecological food products are available, truly sustainable products remain limited (consumer).
- We need to start talking about sustainability and the meaning of a sustainable brand already in kindergartens and schools (farmer), as many people still don't understand what sustainability really is — this is particularly relevant in the Lithuanian context (NKP). (policy advisor, consumer, two farmers in the group agreed)
- It's also crucial to understand that sustainability and ecology are not the same thing. Knowing the difference is key (consumer, farmer).
- Educational efforts through projects are essential (All).
- Greenwashing is a real issue — many brands exaggerate or distort the truth about their sustainability practices (policy advisor, consumer).

3. Business model prototype: 11. Consumer engagement platform for Climate-Smart Agriculture.

Key assumptions behind the prototype:

- Consumers use product climate data in purchase decisions: The platform's effectiveness relies on consumer interest in detailed climate impact information for individual products.
- Retailers invest in labelling and data integration for transparency. Retailer participation is essential to display product climate footprint and foster transparency in-store.
- Suppliers and producers provide accurate ingredient data and support transparency initiatives. Suppliers and producers are willing to provide detailed and accurate data about sourcing and production practices to support transparency and climate impact calculations.
- Consumers value and engage with loyalty rewards for sustainable purchases: Consumers find loyalty rewards for sustainable purchases motivating and are more likely to choose climate-smart products.

Challenges on implementing the business model:

- Lack of human resources and funding for the development and implementation of a labelling system

Comments from the stakeholders:

- Stakeholders responded very positively to this prototype and expressed a strong interest in having it implemented in Lithuania (All, mainly consumer and policy advisor).

- However, challenges remain — particularly a shortage of human resources and difficulties related to certification processes (both policy advisors).
- Quality remains a key concern across all stages of implementation (All).

4. Business model prototype: 12. Peer-to-Peer Knowledge Sharing for Climate-Smart Agriculture.

Key assumptions behind the prototype:

- Farmer Interest in Knowledge Sharing: Farmers see value in connecting with peers to exchange practical, localized knowledge and are motivated to actively participate in a peer-first platform.
- Farmers trust expert contributions to complement peer insights: Farmers trust that expert-validated advice enhances the quality of peer-shared knowledge without dominating the platform and believe expert insights add value to their decision-making.
- Demand for Offline Functionality in Rural Areas: Farmers in rural areas find offline functionality critical.
- Experts and business are willing to contribute to the platform: Experts and businesses are motivated to join the platform to share their knowledge, validate peer insights, and engage with farmers.

Comments from the stakeholders:

- What kind of experts are joining the platform? (both policy advisors)
- Naturally, engagement remains low if there is no real need or demand. (All)

GROUP 2

1. Business model prototype: 7. Open-Source for Climate-Smart Agriculture.

- **Comment by the stakeholders:** The 1st assumption in this business model (farmers are often cautious about implementing untested solutions due to the risks involved such as potential crop losses or financial costs) was found to be inaccurate, hence it was eliminated from the discussion.

Challenges on implementing the business model:

- To determine an optimal membership fee that encourages member engagement and ensures quality assurance.

Comments from the stakeholders:

- Farmers are not so different from entrepreneurs. It's not entirely true that they are overly cautious — it really depends on the individual farmer. Farmers try to assess for themselves what to invest in and how things will turn out (farmer). The first assumption about farmers being too cautious doesn't align with how stakeholders (farmer, policy advisor) see them — the title itself contradicts the description (according to policy advisor), and in such case, the description should take priority.
- Is competition important for farmers? In fact, farmers are very open and cooperative — many willingly share information (farmer, policy advisor). The European Union encourages cooperation, which helps bring people together. Smart people share ideas and experiences, which strengthens the whole community (farmer).
- A key challenge remains how to foster effective communication between researchers, developers, and farmers (policy advisor). How to secure funding? There should be a proactive initiative from primary actors to organize such

meetings — even if there's a cost involved. Of course, farmers need to have the financial means to participate, but it's also important that they remain independent from external corporate interests (consumer, policy advisor agreed).

- There is a shortage of specialists with knowledge that bridges these fields. Institutions like LAMMC (Lithuanian Research Centre for Agriculture and Forestry) are a meeting point between science and farming, but the challenge is attracting young researchers (both policy advisors). In the case of LAMMC and the Agriculture Academy, the quality of students has been improving in recent years, but everything comes back to funding (policy advisor). If young people believe they'll struggle to survive financially in a certain profession, they'll avoid choosing it (policy advisor).
- There are also cultural and systemic issues — including ego, rigid job qualifications, and a bias toward higher education (consumer, policy advisor, farmer). Many are discouraged from pursuing vocational training, even though it can be very effective and produce professionals with specialized skills that are badly needed (both policy advisors, consumer).

2. Business model prototype: 10. Transparency Branding for Climate-Smart Agriculture.

Challenges on Implementing the business model:

- There should be a small number of easily measurable criteria that objectively reflect the essence of the activity
- It is important that the label is trusted

Comments from the stakeholders:

- There's often far too much detailed information that becomes boring and unengaging, and as a result, people don't read it at all (both policy advisors).
- The entire agricultural sector should be approached as a whole — sustainability should not be applied in isolated fragments (policy advisor). The key question is: how do we ensure that everyone moves in the same direction? (policy advisor)
- When consumers don't choose ecological or sustainable products, it's no longer financially viable for farmers to produce them. At the same time, consumers often can't afford these products — prices are too high, and their incomes are too low. This highlights that the success and demand of sustainable products are directly connected to consumer's financial wellbeing (consumer).
- Transparency is critical — consumers need to know exactly what they are buying (policy advisor).
- Farmers also lack proper information about what is harmful for the environment and what isn't (policy advisor). When a farmer uses slightly harmful practice or makes a mistake that impacts nature, they are often reluctant to talk about it — largely because they're already under pressure to farm sustainably. New technologies and machinery, like tractors, are criticized as being harmful, but there are still no widely available, practical, or affordable alternatives. Biomethane or electric options are still not developed or accessible enough (farmer, policy advisor).
- Reliable and trustworthy auditing is essential (policy advisor). Currently, certification bodies often only add costs and create additional financial pressure along the supply chain. The whole system tends to revolve around business interests (policy advisor).
- Products already carry an overwhelming number of labels — adding more only confuses the consumer (both policy advisors).

- It would be incredibly useful to have one clear, unified criterion for assessing a farm's sustainability. But such a system does not exist yet and would be difficult to implement (policy advisor).

3. Business model prototype: 11. Consumer engagement platform for Climate-Smart Agriculture.

Comments by the stakeholders:

- Stakeholders in this group discussed that they would choose sustainable products if they had the financial means to do so (All).
- If people knew, for example, that one apple was better for the environment than another, clear labelling could help them understand how the price reflects its positive environmental impact (both policy advisors and consumer). In stores, people often don't understand why the price is higher, why they should pay more, or where that extra money actually goes (consumer).

4. Business model prototype: 12. Peer-to-Peer Knowledge Sharing for Climate-Smart Agriculture.

Challenges on implementing the business model:

- The beginning of the initiative's implementation, availability of funding, and the coming together of people

Comments by the stakeholders:

- Initial funding is needed to develop such a system, including the involvement of telecommunications providers (policy advisor).
- Nowadays, very few people are without internet access — but if there's no internet, there's also a high chance there won't be any connectivity at all (farmer).
- When it comes to farms, there's still very limited information available (they mean information that would help troubleshoot and fix problems in the farms). A major benefit of such a system would be the ability to bring together many minds with different experiences to find solutions and share knowledge, using minds of experienced farmers (farmer).
- It's equally important to attract and bring together the right people to make this happen (both policy advisors).

GROUP 3

1. Business model prototype: 7. Open-Source for Climate-Smart Agriculture.

Challenges on implementing the business model:

- Seasonality of farm work. Farmers are not always able to participate when events are held
- Data accuracy and relevance. Data comes from farm machinery
- Difficulty bringing together all partners from different sectors
- Funding sources

Comments by the stakeholders:

- The seasonal nature of farming and farmers' work schedules is a real challenge — you can't just bring farmers together whenever you want. Their availability is tied to the agricultural calendar and the natural cycles of their work (consumer, farmer agreed).

- It's also difficult to get everyone on board, especially considering that Lithuanians are generally not very socially active or eager to participate in group initiatives (consumer, farmer).

2. Business model prototype: 10. Transparency Branding for Climate-Smart Agriculture.

Challenges on implementing the business model:

- Consumers provided evaluations but are not willing to pay extra
- Ensuring the reliability of information
- Corruption prevention and avoiding increased administrative burden for farmers
- Competition with cheaper, unsustainable products

Comments by the stakeholders:

- Everyone values the green label — it signals that a product is ecological and sustainable — but in reality, the criteria behind that label are not always fully met (farmer).
- Consumers appreciate products marked as “green,” but they are often unwilling to pay extra for them (consumer, farmer). They usually don't care how the product was grown — whether a diesel or electric tractor was used — what matters most is the final price (policy advisor).
- It's crucial to ensure transparency, because it's easy to say one thing and do another (consumer).
- The biggest challenges remain competition with cheaper products and price pressure in the market (farmer, policy advisor).

3. Business model prototype: 11. Consumer engagement platform for Climate-Smart Agriculture.

Challenges on implementing the business model:

- Consumers rarely read detailed information
- Additional costs with low return
- Ensuring transparency and traceability
- Understanding consumer needs

Comments by the stakeholders:

- It's highly doubtful that every product label is read carefully, especially regarding how sustainable the product actually is (All).
- The general assumption is that if a product has made it to the store shelf, it must be safe and approved for use. For most consumers and even suppliers, the label itself isn't that important (farmer). The green label serves more as a psychological reward for the consumer than as a meaningful indicator of sustainability (consumer, farmer).

4. Business model prototype: 12. Peer-to-Peer Knowledge Sharing for Climate-Smart Agriculture.

Challenges on implementing the business model:

- Low involvement in organization due to a lack of thematic events that would attract a larger number of farmers willing to share their experiences
- Farmers showing courage and initiative when engaging with experts and asking questions
- Insufficient digital literacy
- Habits and resistance to change, as some consumers are unwilling to adapt

Comments by the stakeholders:

- Farmers do share information with one another — from available funding opportunities to technical equipment and tools (farmer). However, there is a lack of financing, no dedicated platform for knowledge exchange, and a shortage of practical tools (policy advisor).
- Currently, only small circles of farmers connect and communicate among themselves. There is a clear need for more meaningful events — not just for appearances or formal consultation, but for real engagement, such as organizing practical farmer workshops (farmer). The challenge is that no one wants to take the lead in organizing; everyone prefers to participate rather than initiate (policy advisor).
- Not all farmers have formal education or extensive knowledge, so they rely on experts and universities. However, trust is an issue — farmers don't always feel confident reaching out to these institutions and may lack the courage to engage directly with experts (farmer, consumer).

7.3.3 Netherlands business model validation exercise

1. Business model prototype: Pay for success

Stakeholders involved in the validation were farmers, advisors, certification party, traders, and auction party.

Assumption prioritization canvas

- | | |
|-------------------------------|------------------|
| • Assumption 1: Relevance Yes | Plausibility No |
| • Assumption 2: Relevance Yes | Plausibility No |
| • Assumption 3: Relevance Yes | Plausibility Yes |
| • Assumption 4: Relevance Yes | Plausibility No |

Challenges canvas

- It will be a challenge to determine what is measured and how it is measured. Amongst the participant there was some discussion on what is climate-smart and how it is measured. They felt that within such a business model, this will be a very delicate discussion amongst the farmers and stakeholders as they have different point of views as it is often a complex system.
- Some indicators are outside the power/control of the growers, so they cannot influence the outcome on which they might be paid. For instance, if it is a very wet growing season with a lot of leaching from soil to surface waters, the amount of nitrogen within these waters will be higher. It might be the case that a particular farmers will not achieve “success” and therefore will not be paid, but the main reason was out of his control. Therefore, it should be very well documented to what extent success can be accounted for by agricultural practices for the farmer.
- However, most participants agreed that good practices should be paid for, instead of a license-to-produce. They felt that the payment for “success” should be transmitted through the value chain and that each party has to pay for success reached by the chain as a whole.

2. Business model prototype: Risk sharing fund

Stakeholders involved in the validation were farmers, certification party, traders, advocacy party

Assumption prioritization canvas

- Assumption 1: Relevance No Plausibility No
- Assumption 2: Relevance No Plausibility No
- Assumption 3: Relevance Yes Plausibility No
- Assumption 4: Relevance Yes Plausibility No

Challenge canvas

- What part of the risk is attributable to this? And what is compensated according to?
- Not all risks farmers face are related to climate-smart practices. Think of market fluctuations, diseases, or individual farm management. So the question is: what specific part of the risk is covered by the fund? It should also be clear: what is the compensation based on? Is it based on a fixed percentage loss, a comparison with averages, or a validated loss assessment?
- There are lots of different risks that are taken
- Risks are taken in arable farming, and they are not always related to climate-smart agriculture. It is complex to capture all these different risks under one fund. Clear demarcation is needed: which risks are accepted, and which are not?
- The fund - the compensation does need to go to the right person who has really been at risk and should be paid for it. It should not be profited from.
- There is a risk of compensating parties who did not suffer an actual loss, or of strategic loss. The fund must therefore have objective assessment criteria and a strong monitoring system. Transparency, independent assessment and possibly peer review can help prevent abuse.
- You will leave entrepreneurship with this
- Removing some of the risk may reduce the incentive for entrepreneurship or innovation. Farmers might opt for less efficient or risky strategies because they will still be compensated in case of loss. The challenge is to strike a balance between support and maintaining a healthy entrepreneurial spirit.
- Who fills the jar of this fund? Who will ensure that money is available in this fund?
- The success of the model depends on the financial filling of the fund: does it come from government subsidies, private chain partners, cooperatives, or consumers (via price mark-ups)? In addition: who manages the fund? Is it an independent foundation, a public body, or a sector organisation? There must be a sustainable and transparent financial model that inspires confidence that the fund will continue to operate in the long term.

3. Business model prototype: Retail choice editing

Stakeholders involved in the validation were farmers, certification party, traders, advocacy party

Assumption prioritization canvas

- Assumption 1: Relevance Yes Plausibility No
- Assumption 2: Relevance Yes Plausibility Yes
- Assumption 3: Relevance Yes Plausibility No
- Assumption 4: Relevance Yes Plausibility No

Challenges canvas

- Retail's revenue model is linked to this.

Currently, retailers' revenue model is often based on high turnover rates and margin optimisation, which in many cases leads to a preference for cheaply produced (often less sustainable) products. By removing unsustainable products from the range, retailers may

lose sales on popular products unless this loss is compensated. So the challenge is: how can this model be made financially attractive to retailers?

- How do you make sure the administration gets but also keeps transparency? And how can it then be audited?

For this model, it is essential to have transparency on which products are considered sustainable, and which are not.

This requires clear administrative processes at both retailers and suppliers: what standards are used? What data is collected, by whom, and how is it accessed? Without transparency, distrust arises among farmers, consumers and regulators.

- How do you make sure all products are covered? Who is going to determine this?

There is a need to avoid tackling only part of the range sustainably, while leaving other product groups out. The group rightly asked the question: How do you ensure that all products are covered by this model? This requires clear demarcation: Which categories are covered by the approach? Will this be rolled out in phases? And what happens to “grey areas”?

4. Business model prototype: Outcomes-based pricing

Stakeholders involved in the validation were farmers, advisors, certification Party, traders, auction party

Assumption prioritization canvas

- Assumption 1: Relevance Yes Plausibility No
- Assumption 2: Relevance Yes Plausibility Yes
- Assumption 3: Relevance Yes Plausibility Yes
- Assumption 4: Relevance Yes Plausibility No

Challenges canvas

- In arable agriculture it is often hard to determine the “single” outcome of a measure, so the causality will be hard to capture as a lot of non-controllable variables will also have an effect on the outcome. Therefore, most attendees do not see this business model work as they feel that that the outcome cannot be controlled by them in many cases.
- In addition, if one is able to capture such a relationship a clear relation to durability/climate-smartness should be documented. Amongst the participants there was quite some discussion on what measure are “climate-smart”. For example, when a government is making policy on particular KPIs, then they feel they have to oblige even if they don't believe this is really “climate-smart”.
- On the other hand, there is a lot of willingness and development in technology going on. Farmers are willing to invest in such techniques already even without this model. This indicates that there is motivation to improve through techniques. If a reward/compensation can be coupled with it then the investment barrier will be even lower.

Main points arising from the summary discussion /Notes from discussion/plenary

The participants saw that there are a lot of fair business models, or parts of them, that have been tried over the years with varying degrees of success. Often the business models are suited for niche markets and can be successful for some, but they are not applicable for the majority of the market. For these more bulk products, the main point is the distribution of profit and risk through the value chain which is now mainly determined by parties at the end of the value chain, i.e. consumers and retailers. The participants felt that if the

cooperation with retailers is set up, there can be room for business models such as those discussed here.

Additional comments/questions from the participants

A key question was how we will proceed from here and what the next steps should be. Additionally, it is important to consider how this can be effectively implemented within the potato supply chain and who will take the lead in driving this forward.

7.3.4 Denmark business model validation exercise

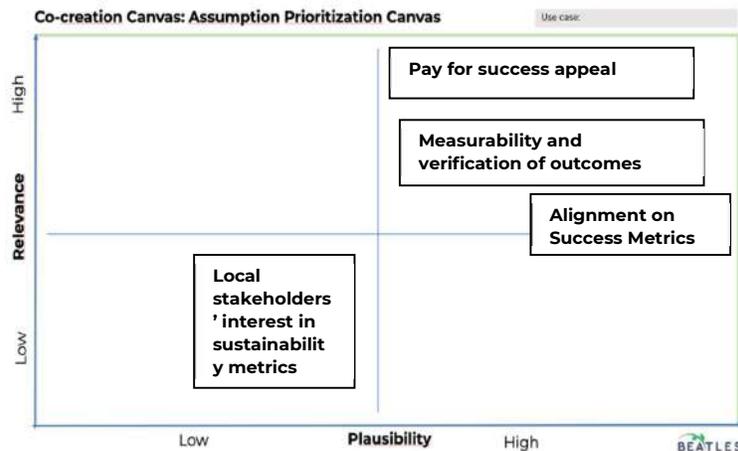
Pay for success, risk sharing fund, and retail editing were selected by the Danish Use Case. Pay for success is similar to a model applied for Danish dairy production wherein ARLA awards farmers for attaining specific goals in a point system. The selection of pay for success was inspired by this model. It was interesting to discuss the chosen BM prototype in the case of pig production. The Danish Crown is using a tool to pay farmers extra if they document their feed consumption and are certified. However, this approach is still not as successful as the ARLA model. In addition, the climate tools available are still under development and documentation is still in progress. The risk sharing fund is beneficial from a cooperative perspective. Funding for Danish agriculture has been previously based on subsidies for implementing climate action that primarily focuses on reducing greenhouse gas emissions based on the CAP interventions. These tools include improved manure management, bio gasification of slurry, barn acidification, and other measures that can help minimize CO2 emissions. However, subsidies are not available at present. The subsidies rely on national legislation and focus, and hence changes.

The participants were divided into 3 groups and provided with 1 business model prototype each. The aim was to 'Validate the key assumptions in the business model prototypes and confirm fair business practices', and the participants were given some time to think about the task, before the facilitator provided support to complete the task.

1. Business model prototype: Pay for success #1

Stakeholders involved in the validation: policy, tech providers, farmer

The 3 structured discussions dealing with the relevance (scored high or low), plausibility (scored high or low) and challenges (statements by the stakeholders) were completed for each of the BMs. The four assumptions were placed on the canvas template as follows:



**Co-creation Canvas:
Challenges on implementing the business model**

Use case:

#1

Realizable if they settle according to it. DC (Danish Crown) has made one but does not settle - DC must use it for internal use.

It's all about climate-smart, but what about biodiversity and animal welfare and how is it measured? - Risk losing some other considerations.

Attitude yes, action no.

Risk of green washing perception.

BEATLES

Comments from participants

Realizable if Danish Crown (DC) settles after that (Arla settles after that, so should be possible).

Yes we think it can be measured/weighed, but our concern is CO₂ impact - are there considerations for animal welfare, biodiversity and other things?

Yes the attitude is you want to pay, but the action is you don't want to pay. You could go for prototype 6. Retail has made the choice for you.

You risk missing some other considerations if you only look at CO₂.

Issue: Construction requirements. If the actual construction of a pig house must live up to climate impact, it can result in production that creates a lot of climate impact. What will the building be used for?

The conclusion of the comments in the work on BM #1 is that Danish Crown (DC) has developed a climate guide but has not fully implemented it. To achieve the goals, DC must use the guide internally and ensure that all stages of production follow the established guidelines. This requires a systematic approach to implementing and monitoring climate-friendly practices.

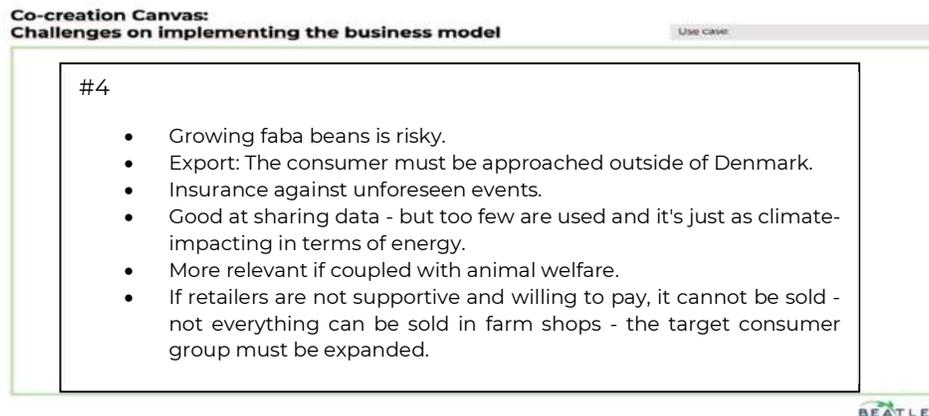
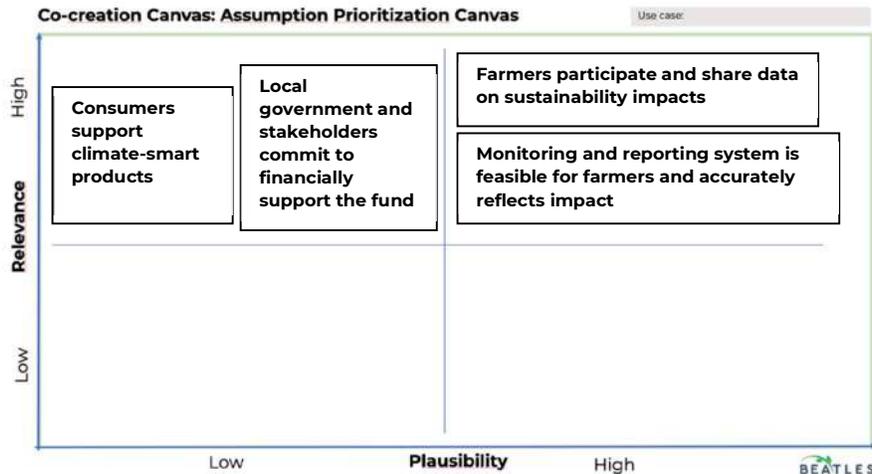
DC focuses on climate-friendly initiatives, but there are concerns about how biodiversity and animal welfare are integrated and measured. Biodiversity can be supported by preserving natural habitats and minimizing the use of harmful substances. Animal welfare is ensured through strict control procedures and collaboration with experts. There is a discrepancy between DC's stated attitude of wanting to pay for climate-friendly initiatives and the actual action, where payment does not occur. This can lead to a perception of greenwashing, where the company appears environmentally friendly without taking real steps. DC has previously been accused of greenwashing in their marketing of climate-friendly products. To avoid this perception, DC must ensure transparency and documentation of their environmental impact and initiatives. This includes clear and verifiable data on CO₂ reductions, biodiversity, and animal welfare.

To achieve climate-friendly goals and avoid greenwashing, DC should:

- Consistently implement and monitor internal climate guidelines.
- Integrate and measure biodiversity and animal welfare in their production.
- Ensure transparency and documentation of environmental impact.

2. Business model prototype: Risk-sharing fund #4

Stakeholders involved in the validation: Tech provider x 3.



Comments from participants

- growing broad beans can be unsafe. Fund supported by public/private actors, e.g. retailers. An insurance that allows you to dare to produce more risky products.
- Farmers want to participate, Danish farmers are good at sharing data
- If retail is not involved, it is not relevant. If they don't want to sell the products, it will be difficult to sell to consumers. Not very likely
- They will do when you ask them, but it has to be the same price. We need to target the 95% we export to. High relevance, but low probability. If you can link animal welfare + climate, consumers might buy it. Climate does not rhyme well with meat. Animal welfare does not rhyme well with climate. Since corona, sales of sustainable meat have fallen, and pig producers have closed.
- High relevance. Don't be accused of greenwashing

Based on the comments during the workshop and in plenum, it was concluded that growing faba beans presents several risks, primarily due to climate and market conditions. To mitigate these risks, insurance against unforeseen events is crucial. Danish farmers are adept at sharing data, but this data is often underutilized and can have a significant climate impact in terms of energy consumption. To make the production of faba beans more relevant and appealing, it is essential to couple climate initiatives with considerations for

animal welfare. However, if retailers are not supportive and willing to pay competitive prices, the products cannot be sold effectively. Farm shops alone cannot sustain sales, so the target consumer group must be expanded beyond Denmark.

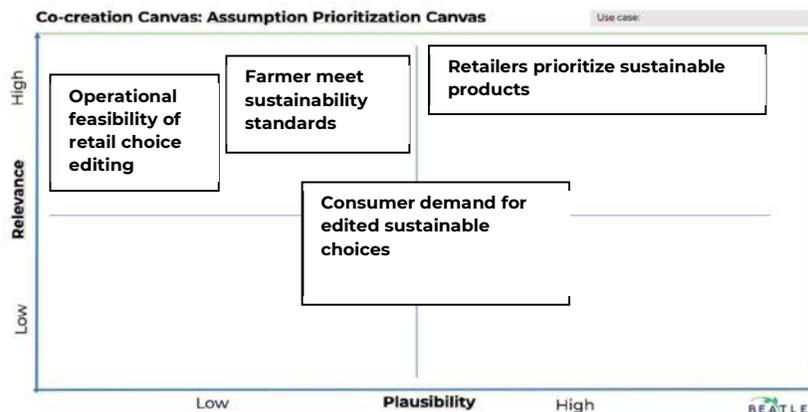
Similarly, growing broad beans can be unsafe and requires support from public and private actors, such as retailers. An insurance fund supported by these actors can encourage farmers to produce more risky products. While farmers are willing to participate and share data, retail involvement is crucial for the relevance and success of these initiatives. Without retail support, selling products to consumers becomes challenging. Retailers must be willing to sell at competitive prices to ensure market viability. Targeting the export market, which constitutes 95% of sales, is highly relevant but has a low probability of success without strong retail support.

Linking animal welfare with climate initiatives can attract consumers, although traditionally, climate and meat do not align well, and animal welfare does not always align with climate goals. Since the COVID-19 pandemic, sales of sustainable meat have declined, and pig producers have faced closures. To avoid accusations of greenwashing, it is essential to maintain transparency and genuine efforts in sustainability.

In conclusion, to successfully grow and market faba beans and broad beans, it is necessary to mitigate risks through insurance and support from public and private actors, expand the consumer market beyond Denmark, ensure retail support and willingness to pay competitive prices, integrate animal welfare with climate initiatives to enhance product appeal, and avoid greenwashing by maintaining transparency and genuine sustainability efforts.

3. Business model prototype: Retail-choice editing #6

Stakeholders involved in the validation: Innovation manager, Tech provider x 2.



Co-creation Canvas: Challenges on implementing the business model

Use case:

#6

- The demand is there but the willingness to prioritize is lacking.
- Building up production requires time to get ready for retail (lack of climate-smart products on the shelves so consumers don't know about them).
- ESG for measurement and reporting is not yet mature.
- Confused consumers - what is what, many grey areas (and shades of 'climate-smart products') and not clearly defined what CA products are and what the requirements are.
- The focus is still too narrow and this is a risk.
- Requirements for construction - this does not include feeding and impact on climate, for example.
- There must be something to offer.
- Will the customer pay for the additional cost?
- How will it be financed? Government/grants - need strong capital (manufacturer)
- If everyone did it, it would be feasible.
- Retail willing to pay more
- Who will pay? Innovation/development?
- Willingness from the producer.
- Labelling scheme
- Communicate to the consumer what climate action is.
- ESG tool (ESGreenTool) - requires that it is mature to be used as a tool in the value chain and can handle the high complexity of the value chain.
- Push/pull effect.



Main points arising from the summary discussion

Feasible if DC pays for it (Arla pays for it, so should it be possible).

Comments from participants

- High plausibility
- High relevance, but not so sure it can be done
- "Ecology" is locked in (not able to change much)
- Need to start with low requirements for regenerative farming
- Consumers are confused

Based on the comments during the work on BM #6 and the additional comments, it is concluded that the demand for climate-smart products exists, but there is a lack of willingness to prioritize their production. Building up production to meet retail needs requires time, and the current lack of climate-smart products on the shelves means consumers are not fully aware of them. The Environmental, Social, and Governance (ESG) framework for measurement and reporting is not yet mature, adding to the complexity.

Consumers are often confused by the many grey areas and varying definitions of climate-smart products. The focus on climate-smart agriculture is still too narrow, which poses a risk. Construction requirements for climate-smart agriculture do not always consider factors like feeding and overall climate impact. There must be a clear offer to attract consumers, but it is uncertain whether customers will be willing to pay the additional costs associated with these products.

Financing is another challenge. Strong capital investment is needed, potentially from government grants or manufacturers. If all stakeholders, including retailers, are willing to

pay more, the initiative could become feasible. However, questions remain about who will bear the costs of innovation and development. Producer-willingness is also crucial.

A labelling scheme is necessary to communicate to consumers what constitutes climate action. The ESG tool (ESGreenTool) needs to mature to handle the high complexity of the value chain effectively. There is a push/pull effect in the market, where editing retail choices for climate-smart agriculture has high plausibility and relevance, but it is uncertain whether it can be fully implemented. The ecological aspects are somewhat locked in, limiting the ability to make significant changes. Starting with low requirements for regenerative farming could be a practical approach. While the relevance of climate-smart agriculture is high, its implementation faces several challenges, including consumer confusion, financing, and the need for mature measurement tools. Clear communication, strong stakeholder commitment, and phased implementation could help overcome these obstacles.

7.3.5 Spain business model validation exercise

1. Prototype 12 - Peer-to-Peer Knowledge Sharing for Climate-Smart Agriculture

Description: A peer-to-peer knowledge sharing platform where farmers exchange advice, best practices, and real-time updates to address common challenges, with an option for offline access to ensure connectivity in rural areas. The platform can be open to experts and businesses, but farmer-to-farmer interactions remain the core mechanisms and external contributions are structured to complement peer insights.

Key assumptions behind the prototype

- Farmer Interest in Knowledge Sharing: Farmers see value in connecting with peers to exchange practical, localized knowledge and are motivated to actively participate in a peer-first platform.
- Farmers trust expert contributions to complement peer insights: Farmers trust that expert-validated advice enhances the quality of peer-shared knowledge without dominating the platform and believe expert insights add value to their decision-making.
- Demand for Offline Functionality in Rural Areas: Farmers in rural areas find offline functionality critical.
- Experts and business are willing to contribute to the platform: Experts and businesses are motivated to join the platform to share their knowledge, validate peer insights, and engage with farmers.

Stakeholders: farmers (3), advisors (1), processors (1)

The **key assumptions** were discussed and assessed. While all were considered similarly relevant, the first and third assumptions were regarded as the most plausible.

The following **challenges** were identified and discussed:

Participatory creation: all the people in the focus group consider the initiative feasible and very interesting. It could be developed as an app. They consider it essential to create the platform in a participatory way with the involvement of all stakeholders, so that it can become a useful tool and does not fall into disuse.

Opportunity to give and receive feedback, experience and guidance: it is valued that the app can be an effective tool for sharing opinions, experiences and resolving doubts, at different levels.

Prior content review (verification): The app would involve different stakeholders from the local apple value chain. The app could be used to share experiences and opinions with other people, but it is essential that technical and scientific experts are involved, who can provide verified answers based on experimentation or scientific evidence, if available.

Agility: The responses and communication flow in the application should be agile and effective, with the aim of being really useful for day-to-day issues, without getting into lengthy discussions or vague and repetitive.

Potential to attract young people to the sector: Such an app is adapted to current communication channels and can be a very attractive tool to support young people entering the agricultural sector.

2. Prototype 2 – Crowd-farming for Climate-Smart Agriculture

Description: Crowd-farming for Climate-Smart Agriculture operates an “adoption farming” model where consumers can adopt a tree, plant, or animal from a climate-smart farm.

Key assumptions behind the prototype

- Sustainable practices appeal: Consumers value climate-smart agriculture and are willing to support farmers who adopt sustainable practices through their purchasing decisions.
- Consumers' willingness to prepay: Consumers are comfortable with the prepayment model for adoptions and pre-orders, even if it requires them to wait for seasonal produce.
- Platform fee: Farmers are willing to pay a commission fee to maintain a platform in exchange for direct market access and pricing control.
- Consumer Interest in Farmer Engagement: Consumers value a personal connection to their food source and are interested in receiving updates on farm activities, metrics, and produce options, enhancing their sense of community and engagement with farmers.

Stakeholders: farmers (2), processors (1), consumers (1)

The **key assumptions** were discussed. None were considered highly relevant, with assumptions 1 and 3 rated as moderately relevant, while 2 and 4 were deemed not relevant at all. In terms of plausibility, assumption 4 was seen as quite viable, assumption 2 as not viable, and assumptions 1 and 3 fell somewhere in between.

The following **challenges** were identified and discussed:

- Improved communication between producers and consumers (including an educational role)
- Greater participatory collaboration with producers in the food acquisition process
- Interest in such an initiative at the local level
- The need to translate sustainability into the logistics aspect
- The recognition that a single-product offering is insufficient—there is a need for a broader selection or a more diverse food basket.

Two of the workshop participants (farmers) were directly involved in this initiative and shared their perspectives. They consider Crowd-farming a very interesting project and have successfully marketed part of their products (not apples), mainly in Germany. Their experience has been positive, although they believe the initiative would be more appealing if it allowed them to offer a broader range of products by combining them with those of other participating producers.

The other attendees also expressed interest in the initiative Crowd-farming. They highlighted the need for more locally-focused efforts, particularly considering GHG emissions and their environmental awareness. In this regard, combining products in a single order would be beneficial, but it would require a structure to manage the preparation and distribution of joint orders. They place high value on the environmental sustainability aspect of the initiative.

In terms of logistics, they emphasised the importance of carefully planning delivery routes to avoid unnecessary travel and reduce emissions. They also pointed out a significant lack of awareness among consumers, suggesting that more effort is needed to inform and engage this sector.

They mentioned the existence of similar initiatives, such as “Cercaneo” (<https://cercaneo.consumo.gob.es/inicio?language=en>), which has recently been launched. However, they believe that consumers are not yet ready to pay in advance for the products they sponsor.

Finally, they noted that many producers lack essential knowledge, highlighting the need for further training and capacity-building in the sector.

3. Prototype 9 - Shared Resource Pool for Climate-Smart Agriculture

Description: A shared resource pool model through a platform enables farmers to access agricultural machinery or advanced agri-tech tools on a rental or pay-per-use basis. This model reduces the cost burden of ownership while addressing issues of machine underutilization and fostering collaboration. By sharing equipment and service, farmers can enhance productivity, sustainability, and access to climate-smart technologies.

Key assumptions behind the prototype

- Demand for Pay-Per-Use Technology Access: Farmers are willing to pay for the technology on a usage basis rather than investing in ownership.
- Trust in Shared Resource Model: Farmers trust the shared resource model and are comfortable renting equipment that other community members also use, provided there are maintenance guarantees.
- Operational Feasibility of Shared Access: The logistics of booking, maintaining, and using shared resources are operationally feasible, and farmers believe that access can be efficiently managed.
- Community Willingness to Support Maintenance Fees: Farmers are willing to contribute a portion of their fees to support equipment maintenance and training for optimal usage.

Stakeholders: farmers (2), processors (1), consumers (1), advisors (1)

The **key assumptions** were discussed. Assumptions 3 and 4 were deemed the most relevant, with high relevance, while assumptions 2 and 1 were considered of medium relevance. In terms of plausibility, none were evaluated as highly plausible. Assumptions 1 and 4 were rated as moderately plausible, assumption 2 was slightly less plausible, and assumption 3 was considered the least plausible.

The following **challenges** were identified and discussed:

- Efficient management of use and equal access: Ensuring fair distribution and effective usage of resources.
- Certain types of machinery are more feasible than others: Harvesting machines can be more problematic due to overlapping harvest dates, complicating scheduling.

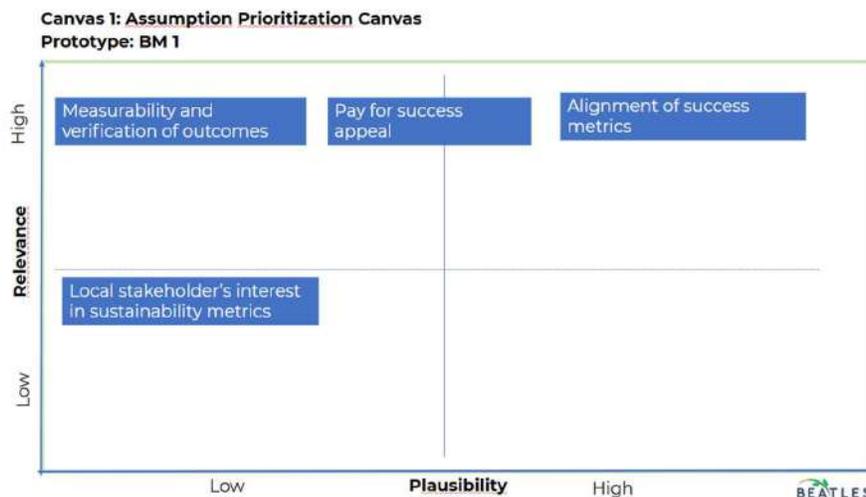
- Geographical location of producers: Producers may be located far apart, leading to mismatched needs and logistical issues.
- Difficulty in establishing usage rules: Clear guidelines are necessary for repairs, penalties, and usage definitions to avoid misunderstandings.
- Individualism and a lack of collaborative mentality: Society's tendency toward individualism may hinder collective action and cooperation.
- Machinery maintenance: Regular maintenance is required, which can be costly and complex to manage.
- The challenge of sharing needs and interests: Producers often have different priorities, making collaboration and joint planning difficult.

7.3.6 Germany business model validation exercise

To validate the fair business model prototypes, which are based on the results of the CCW in 2024, participants were first made familiar with the timeline of WP4. Afterwards, each prototype was shortly presented to all participants. After explaining the task, participants were separated into small groups. The facilitator decided to group participants based on the way they were seated in groups and allocated only one CSA specifically to a group – the person responsible for managing the Ökomodellregion (Bio-district) worked on the respective prototype. In the Results section below, one can see which prototype was validated by which stakeholders. The small groups were provided with two canvases and a description of each prototype (provided by WP 4). The information on Prototype 3, consumer-driven pricing, were enriched with screenshots of the website “DubisthierderChef” to help participants better understand the concept. Also, participants were provided with a questionnaire which explained all the presumptions (provided by WP 4) and questions for each assumption, whether the assumption is relevant and plausible on order to help finding the right positioning of the assumption on the canvas. During the discussion in the group, the questionnaire was filled and the assumptions were placed on the canvas. After lunch break, the results were presented to the other stakeholders (audio recording exists).

1. Business model prototype 1: Pay-for-Success of Climate-Smart Agriculture

Stakeholders involved in the validation: advisors, processor

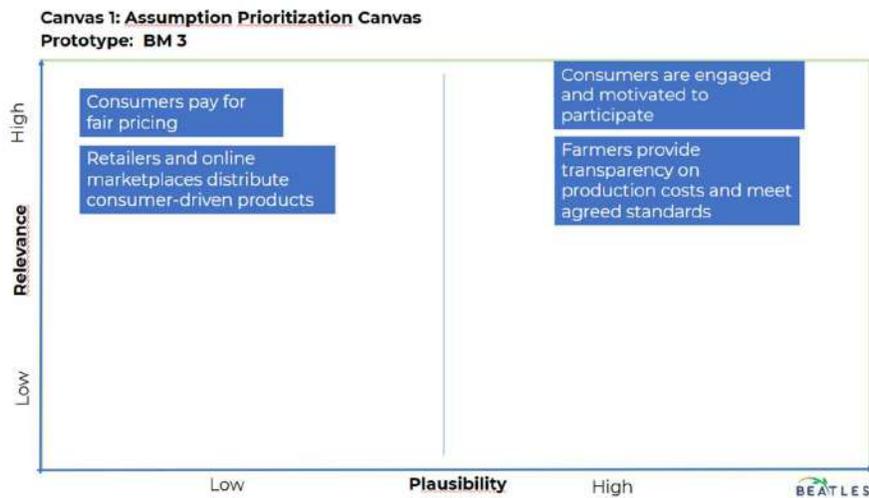


Challenges (and additional explanation):

- No “planning security” for farmer – he cannot be sure whether he will reach the agreed targets in order to receive a payment
- It is hard to measure the environmental outcomes and also what farmers actually did in order to improve environmental performance – therefore it is hard to put it into practice and to also compare the different farmers
- There is a risk for trade-offs – if not conceptualised in a good way: in order to reach a certain sustainability goal, other important indicators might be overlooked leading to an overall decreasing sustainability performance

2. Business model prototype 3: Consumer-driven fair pricing

Stakeholders involved in the validation: farmer, advisor, processor

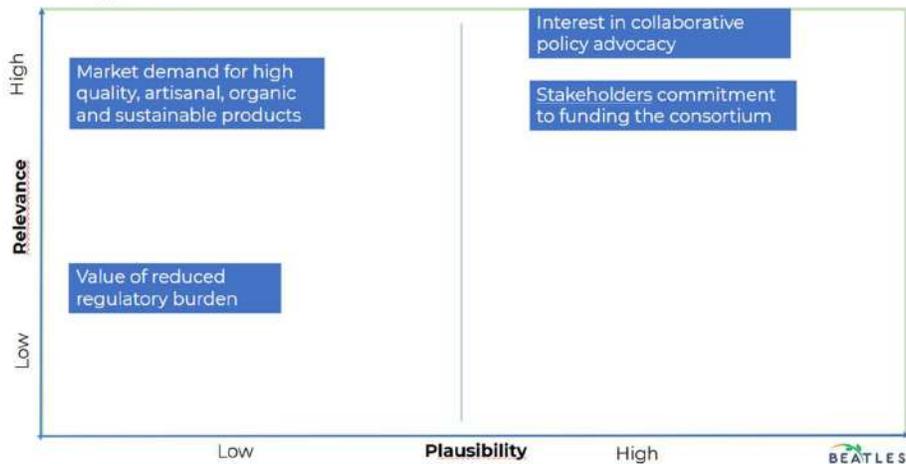


No challenges identified for this BM.

3. Business model prototype 5: Bio-districts for Climate-Smart Agriculture

Stakeholders involved in the validation: government agencies, breeding association

Canvas 1: Assumption Prioritization Canvas
Prototype: BM 5



Challenges:

- Dependent on local politics
- Dependent on agri-political conditions
- Local market partners (e.g. dairy) need to decide to join the concept – project is dependent on their decision
- Farmers need to be open to engage in the bio-district
- Farmers associations need to also engage
- Consumers might not always be willing to buy products of the bio-district
- Education is needed for schools and young people (such as farm visits) – requires high personal effort
- Consumers need to be educated about bio-district through media

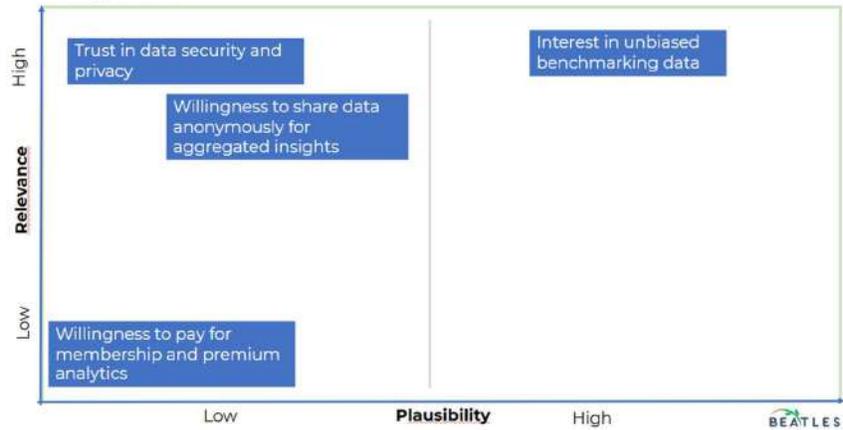
Additional remarks:

- In Germany, farmers do not need to pay for financing the bio-district – only local communities (80%) and the state government (20%) pay for the bio-district

4. Business model prototype 13: Data Coopetition Network

Stakeholders involved in the validation: advisor, farmer

Canvas 1: Assumption Prioritization Canvas
Prototype: BM 13



Challenges:

- Retailers or processing companies might not be interested in transparency
- Data security might be an issue if not functioning (hacking)
- There is already a lot of platforms offering transparency on farm level:
 - o Parameters of milk (LKV)
 - o Prices of milk (Naturland)
 - o Prices for meat (media/press)
 - o Prices for feed (media/press, ZMP)
- Additional need for farmers to include their data in the platform