

D3.12: Ploutos Consolidated SCBMI

WP3 – Sustainable Collaborative Business Model Innovation

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Executive summary

The Ploutos project revolves around a number of digitization innovation initiatives focused on sustainability. In order to shape and maximize the probability of value creation and capture the leveraging of these innovations, the latter are supported through sustainable collaborative business models (SCBMs). SCBMs emphasize collaboration and mutual value creation and capture between value chain stakeholders to achieve long-term sustainable impact. To support the development of these business models, an innovative and participative approach for supporting sustainable collaborative business model innovation (SCBMI), as defined in *D3.2: Ploutos SCBMI approach - final version*, has been developed. This approach has been developed and validated through interactions with the *innovation initiatives* (the Sustainable Innovation Pilots in Ploutos). Interactions with the innovation initiatives focused on the design of new business models or focused improving upon current business models for the innovation initiatives to achieve sustainable impact. They considered the role of technological, behaviour and business innovation in developing new business models, understanding how the joint consideration of these pillars contributes towards business performance. It also focused on how these business models can help to solve importance challenges such as rebalancing agri-food supply chains or stimulate the proliferation of digital innovation to tackle societal or environmental challenges. Through these interactions, important learnings, insights and best practices were derived which are valuable to consider when pursuing SCBMI or can help to support its application in practice.

In this report, we consolidate these findings, learnings and insights generated through Ploutos on the application and use of sustainable collaborative business model innovation in the agriculture domain. Specifically, we provide a user manual on the value and application of SCBMI in practice to address challenges in the agri-food domain. It covers an explanation of the structure for the SCBMI approach as well as important considerations when applying it in practice. It can be considered as a set of '*Frequently Asked Questions*' (FAQs) to help stakeholders working on establishing sustainable impact through digital innovation to get started.

In addition to the SCBMI approach, this report also lists the tools available for SCBMI. The tools available can be divided into three categories, namely supporting the *exploration*, *design*, and *exploitation* of SCBMs. Accordingly, the tools can be used to inspire SCBMI, can help to structure or analyse the configurations of SCBMs or can be used to identify further opportunities for value creation and capture as part of SCBMI. Per tool, we provide helpful guidance on why and when the tool can be used.

Lastly, through the work with the innovation initiatives, we also identified important learnings from practice which can help to further support SCBMI. Specifically, we highlight how innovation initiatives have employed different governance structures to support the adoption of digital innovations, overcoming behavioural and financial barriers. Similarly, we indicate that farmers can employ different value propositions or business models to create and reap the benefits of parallel value streams. Moreover, we stress the importance of trial-and-error when working with SCBMI and as well as that collaboration is key in overcoming previously considered wicked problems.

1 Introduction

1.1 Project Summary

The Ploutos project focuses on rebalancing the value chain for the agri-food system, transforming it into one that works for the benefit of society and the environment. The project develops a Sustainable Innovation Framework that applies a systemic approach to the agri-food sector, building on three pillars: Behavioral Innovation, Sustainable Collaborative Business Model Innovation and Data-driven Technology Innovation. Exploiting a history of significant agri-food projects and the respective ecosystems around them, the project deploys 11 innovative systemic Sustainable Innovation Pilots, where by adopting a Multi-Actor Approach innovative solutions and methodologies are implemented, tested, assessed, generating practical learnings. The pilots cover a large range of agri-food ecosystems, across 13 countries, covering arable, horticulture (both open fields and greenhouses), perennials and dairy production among others. In each case, behavior change, collaborative business modelling and data driven innovation are integrated to deliver the most environmentally, socially, and economically sustainable solution. Moreover, a Ploutos Innovation Academy is established as a vehicle for integrating the know-how, best practices and assessments developed across the project and derived from the Sustainable Innovation Pilots. Ploutos includes 33 partners, 22 of them being end-users, representing all relevant actors in the food system, including farmers, food industry companies, scientists, advisors, ICT specialists and policy makers.

1.2 Document Scope

Deliverable *D3.12: Ploutos Consolidated SCBMI* consolidates the findings, learnings and insights generated on the application and use of sustainable collaborative business model innovation in the agriculture domain. It brings together the outputs generated as part of WP3 and as part of previous deliverables within this work package. Specifically, it builds upon the following deliverables:

- *D3.2: Final Ploutos SCBMI approach*
- *D3.4: Final Version of Reference Sustainable Collaborative Business Model Archetypes*
- *D3.5: Valorization Model for Data and Digital Services*
- *D3.8: Training Material for SCBMI – Final Version*
- *D3.11: Final Ploutos SCBMIs and data/service valorization for pilots*

This deliverable should be considered as a manual on how sustainable collaborative business model innovation can be applied and embedded for innovation initiatives (i.e., collaborative innovation actions) in the agricultural domain. Its intended audience therefore includes pilot stakeholders (such as the Sustainable Innovation Pilots in Ploutos, but could also reflect pilots or initiatives in similar projects, as long as their intention is to support collaborative innovation actions) or consortium leaders which are driven by promoting or by pursuing (collaborative) exploitation of digital innovations in practice. These innovations can be marketized as data-driven services offered to end-users, for which it is important to consider how they contribute to value creation and capture for stakeholders involved, and how collaboration and partnership can help in enhancing this. Accordingly, we intend to support the innovation and development of the corresponding sustainable collaborative business models, to which this deliverable is geared. Therefore, this deliverable provides helpful guidance on how the development process for these type of business models (as well as presenting general learnings and recommendations generated throughout the application of Ploutos) can be supported.

1.3 Document Structure

The document is structured as follows:

- **Chapter 1** presents an introduction to the project and the document.
- **Chapter 2** describes the purpose, value and use of the SCBMI in agri-food value chains. It explains how the SCBMI approach can be used and operationalized in practice for an innovation initiative willing to pursue sustainable impact. It delineates what characteristics should be in place to apply SCBMI and how pilots should organize themselves to make the most out of SCBMI. It also provides helpful tips and commonlyfaced challenges which can be considered when applying SCBMI.
- **Chapter 3** offers a deepdive in the tools available to support SCBMI. Specifically, it explains the use of *reference business models* to support the ideation of sustainable collaborative business models, which illustrate options available to pilots to consider as part of SBCMI. In addition, it details the *data valorization framework* which is used to analyse how value is (co-)created and what other pathways exist toward value creation through data exchange. Lastly, this chapter also explains the toolbox available to support the design of SCBMs and how these tools can best be used. The three categories (reference business models, data valorization framework, toolbox for SCBMI) can be subdivided into tools catered towards the exploration, analysis and design of sustainable collaborative business models respectively.
- **Chapter 4** lists generic recommendations and insights which users of SCBMI should take into account. These recommendations and insights are based upon experiences with the innovation initiatives through Ploutos. It offers further guidance to users conducting SCBMI.
- **Chapter 5** concludes this deliverable as well as provides pointers for further reading.

2 SCBMI – an overview

2.1 What is the SCBMI?

Sustainable Collaborative Business Model Innovation (in short, SCBMI) represents the process of *innovating business models* by means of *establishing new collaborations or improving upon or through existing collaborations* to create *sustainable impact*. The resulting *sustainable collaborative business models* represent business models which are geared toward creating collective, sustainable (i.e. merging planet, people and profit) value. Accordingly, SCBMI concerns the pursuit of new business models which stress collaboration between (value chain) partners, with the goal to contribute towards sustainable and societal impact. As a result, it differentiates itself from traditional business model innovation which often focuses on (individual) firm performance or profit maximization.

2.2 Why do I need to consider SCBMI?

SCBMI focuses on establishing collaborations and partnerships between value chain partners to create collective, sustainable value. Through SCBMI, a value chain (through active commitment and participation from its value chain stakeholders) can transition from traditional business practices towards the provisioning of services or products which foster sustainability. This is particularly relevant in the context of the agri-food industry. Value chains in the agr-food industry include many stakeholders such as farmers, food processors, wholesalers and retailers (amongst others, see Figure 1). Through their collective efforts, products such as fruits, vegetables and meat and dairy are marketed to consumers. Logically, each stakeholder within this value chain impacts the degree to which the products are sustainably produced and marketed – it is impacted by the way food is produced, how it is transported or how it is distributed or sold to consumers. Therefore, achieving sustainable impact in the agri-food industry means that **all stakeholders** within the value chain should shift or align their business practices to truly achieve sustainable effects. To do so, it is important to understand the drivers and motivations of each stakeholder in the value chain, and to align these drivers and motivations towards a common goal to achieve sustainable impact.

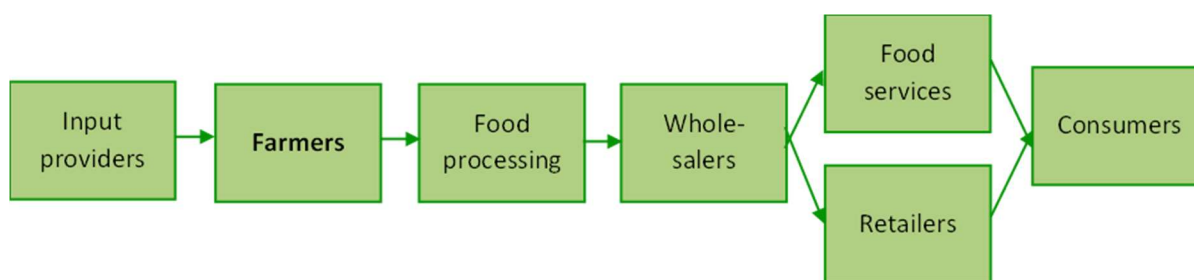


Figure 1 – Typical value creation and delivery system in the agri-food value chain

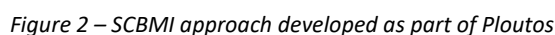
More so, SCBMI can contribute towards rebalancing the value chain: to support the position of farmers in agri-food value chains to capture additional value and to improve upon their current position. Farmers, being positioned *upstream* in value chains (i.e. at the forefront of where food is produced), face several challenges to support their survivability:

- *Power imbalance* as retailers increase in size yet become fewer in number, thus creating monopolistic structures reducing the bargaining position of farmers in the market, as well as the degree to which they can capture value for their produce.
- *Market access* as most food products are now routed through large trading companies or (regional) distribution centers and several processing stages which increases the distance

- *Farmer size and composition* as farmers tend to be small businesses with few employees. Consequently, farmers are often “generalists” or “all-rounders” who have to run all aspects of their business, putting pressure on maintaining operations and ensuring that activities can be conducted efficiently and effectively.

All-in-all, SCBMI, given its holistic perspective and its focus on establishing *mutual value* for stakeholders involved, offers pilots and consortia wishing to strive for sustainable impact the foundation to explore how new business configurations should be set up to do so and to investigate how digital solutions can support this pursuit.

Through business modelling efforts in the context of Ploutos, a practical approach to support the execution of SCBMI has been defined. This approach is illustrated in Figure 2.



One can see that five phases are introduced as part of the SCBMI process:

- *Analysis phase*, in which the proposed digital innovation to achieve sustainable impact and its effect on the agri-food value chain are assessed (**understand**). In this regard, the individual goals and objectives of stakeholders are investigated upon (**individual alignment**). Additionally, this phase focuses on aligning these goals and objectives towards a common collective goal ('exploration and ambition').
- *Design phase*, in which the pilot or consortium focuses on the (iterative) design of one or more *sustainable collaborative business models* which support the realization of the proposed digital innovation and which contribute towards mutual value for stakeholders involved as well as collective value towards supporting sustainability (**design, evaluate, adapt**). These sustainable collaborative business models can differ in configuration to realize different digital innovations, cater to different value chains or to fit different end-consumers.
- *Evaluation phase*, in which the sustainable collaborative business model alternatives are assessed regarding their long-term viability, feasibility and robustness, and the degree to which mutual value is created for stakeholders involved (**assess**). Given the challenges faced by farmers in agri-food value chains, emphasis is placed on ensuring that the farmer is *better off* through participation for the new business model.
- *Implementation phase*, in which commitment of stakeholders is needed to roll-out and support the realization of the business model in practice. Each stakeholder should reflect whether the business model design results in a positive business scenario (which should be considered in light of their personal drivers and motivations). Once commitment is achieved, stakeholders should work towards defining implementation plans to support the roll-out of the business model, assigning activities and responsibilities to stakeholders involved (**roadmap**).
- *Scaling phase*, in which the pilot consortium should focus on the gradual scaling of the sustainable collaborative business model and to monitor its performance over time to see whether sustainability targets are being reached (**monitor**). To do so, scaling strategies should be defined and evaluated which delineate how the business model will be scaled over time (for example through expanding on the consumer base or through diversifying its value proposition to different consumer segments).

To operationalize the SCBMI approach, we propose a practical workshop based format. We refer to **Text box 1** for a detailed explanation of this format, as well as what tools can be used to support each workshop.

2.4 What are preconditions for SCBMI?

As indicated, SCBMI concerns a collaborative innovation action, involving value chain stakeholders as well as ecosystem partners to create collective, sustainable value. Logically, this means that an innovation initiative should have some understanding of what innovation it intends to realize, what value it intends to create or what challenges it desires to overcome in the grand scheme of collective value. In the following, we list several requirements or preconditions that should be in place for any innovation initiative to start thinking about SCBMI – as starting without satisfying these conditions would mean that either time is spent inefficiently or would make it difficult to start the SCBMI approach.

The following preconditions should be in place to effectively start the SCBMI approach:

Precondition: The problem, idea or solution for conducting business model innovation should be clear. Alternatively, it should be clear how this need can be explored or articulated

Rationale: Without a clear objective as part of the SCBMI, it will be difficult to focus the efforts of stakeholders as part of the SCBMI phases. There is a need for a clear driver (such as a need to be addressed, a problem to be solved or a solution to be realized), which will help stakeholders to align their efforts towards achieving this objective. It helps provide purpose as to why SCBMI should be pursued in the first place.

There can be different drivers as to why SCBMI should be pursued. These drivers could stem from a future need to innovate, as digital or sustainability regulations are forcing agri-food value chain stakeholders to transition towards different business practices. This calls for a reconsideration of existing business models to which SCBMI can be employed. Similarly, technological developments may offer new solutions to further improve on business practices or contribute in the context of sustainability. These solutions may enable new value propositions which can generate additional value for stakeholders involved. To effectively embed such solutions as part of existing business practices (or to set up new business practices), SCBMI can be pursued.

Precondition: There is a clear need for collaboration to address the intended objective

Rationale: In contrast to traditional business modelling, which focuses on the perspective of a single organization, SCBMI takes a multi-actor approach towards business model innovation. If a stakeholder is able to ‘solve’ the problem or objective on its own, there is no need to conduct SCBMI (as there is no need to align the perceptions and incentives of different stakeholders to achieve the overall objective). Conducting SCBMI is therefore very much a collaborative approach, for which the contributions of all relevant stakeholders are needed to overcome wicked problems or grand challenges (recognized by stakeholders involved). Therefore, there should be an explicit need for collaboration to make SCBMI worthwhile.

2.5 Who should conduct SCBMI?

SCBMI is intended for the development of new collaborative business models for sustainability, through realizing new digital innovations and collaborations in practice. It adopts a holistic perspective on existing agri-food value chains and how these value chains should be adapted to strive for sustainability impact.

Accordingly, SCBMI is very much a strategic endeavour: it requires stakeholders involved to rethink their business operations and to transition towards sustainable practices. It involves establishing new collaborations with partners to co-create value. It demands commitment and determination to drive this change. As a result, users of the SCBMI should be able to drive decision making for their respective organizations. This means that users should either have decision making power to do so, or should be able to (directly) influence strategic management to foster change. Without strategic support, business processes cannot be changed as there is no clearance to do so, meaning it is difficult to realize impact.

To use the SCBMI, a composition of different functions, such as **operations** (to understand the impact of innovation of day-to-day business processes), **strategy** (to drive the vision or long-term objectives of an organization), marketing (to create value for end-users and connect to relevant markets), and

control (to understand the financial impact of realizing new innovations) per stakeholder involved for the value chain is preferred: this ensures that all facets of the organization are taken into account. These representatives work together with representatives of other stakeholders to work through the phases listed for SCBMI to develop new sustainable collaborative business models and to jointly assess how potential challenges can be faced. Logically, given the fact that representatives in terms of operations are often more heavily involved in day-to-day practices, and can as such better assess what implications changes to these business practices may have, these representatives can be put at the forefront of the SCBMI work. However, we emphasize that strategic support should be present to make this exploration and analysis for SCBMI worthwhile.

Typically, in innovation hubs or pilot consortium settings, we see that representatives of stakeholders in value chains are present to explore and assess the impact of digital innovation on sustainability. However, we observe that such initiatives call for strategic support to drive change in case positive outcomes are obtained. Therefore, we advocate that this power to influence strategic decision making (either directly or indirectly) should be present for users of the SCBMI.

TEXT BOX 1 – A workshop based structure to support the SCBMI approach in practice.

The workshops listed below follow the phases indicated for the SCBMI, and are geared towards generating answers on the aspects listed as part of SCBMI. This workshop list includes recommendations for tools which may be considered to support pilot consortia in doing so. For a detailed description of how the tools work, we refer to Section 3.

Workshop 1 – Onboarding and value proposition statement: this workshop serves to understand the drivers, motivations and perceptions that stakeholders may have regarding the pilot initiative or innovations to be realized. It consists of one-on-one interactions with stakeholders in which they are allowed to express concerns, potential conflicts of interests or challenges they foresee which may affect future SCBMs. The goal is to create a trusted setting in which stakeholders are free to communicate their thoughts, such that potential conflicts and challenges can be addressed early on for the SCBMI approach. It also helps to align the individual objectives of stakeholders as much as possible to the overall collective objective (to foster sustainable or societal impact). In addition, it is worthwhile to analyse to what extent stakeholders are familiar with business modelling, such that additional support can be offered when needed. Workshop 1 is concluded using the **value proposition statement tool**: this helps to become concrete on *what innovation is deployed, how it in a general sense will create value and for which consumer groups*.

Workshop 2 – DAMIAN and Customer Journey: this workshop continues the discussion on the innovation at play, investigating *how* the solution will be used in practice by customers or consumers, and *what* is needed in a technical sense to support the solution (and how these responsibilities are distributed). To support this, we use the customer journey and DAMIAN tool respectively. The **customer journey tool** helps in clarifying how pains are taken away and how gains are created for customers through use of the innovation. The **DAMIAN tool** helps to clarify how data will be used to support in this endeavour. After workshop 2, the stakeholder group should achieve consensus on *how* the innovation will work in practice and how it will create value for customers, as well as have initial insights on what investments and actions are needed to realize the innovation in practice.

Workshop 3 – Business Model Radar: in this workshop, stakeholders focus on the joint development of SCBMs, building upon the insights generated through workshops 1 and 2. To support this task, the **Service-Dominant Business Model Radar** is used. The resulting SCBMs should describe how the innovation at play will be realized in practice, what stakeholders are involved to do so (and their respective roles and activities) and how costs and benefits are shared for the collaborative network. As we emphasize mutual value creation and capture, each stakeholder should perceive to be 'better off' through participation. This may require shifting costs and benefits between stakeholders to achieve this. The facilitator acts as a broker between parties in the collaborative business model (whilst maintaining and emphasizing the necessity of 'collaboration') and helps in driving the discussion on how costs and benefits are distributed. The workshop is concluded when all stakeholders conclude that, in a qualitative sense, the business model(s) is (are) viable.

Workshop 4 – Benefits Realization Mapping: in this workshop, stakeholders investigate how the business models designed in the previous workshop will be *operationalized and scaled* over time to achieve impact. To support this workshop, **Benefits Realization Mapping** is used. The objective is to map the investments, activities to be executed and changes in behavior needed to support the sustainable collaborative business model in practice. This means that all stakeholders should reflect on what changes they should make, and how these changes may be dependent or influence activities of other stakeholders. It therefore serves to establish collective action between stakeholders involved. It also addresses the strategies employed to scale the business model over time.

Workshop 5 – Business Model Evaluation: in this workshop, the business model design is formally evaluated, based on the criteria 'viability' (degree to which value is created for stakeholders), 'feasibility' (degree to which the business model can be realized in practice), 'robustness' (degree to which the business model can respond to market, regulatory or societal changes) and 'desirability' (degree to which the business model is valuable to the consumer). Stakeholders should collaboratively discuss each criteria and judge or 'score' to what extent the business model performs for each criteria. It should result in a Go / no-Go decision to start committing resources. If the business model design does not perform well for a certain criteria, the stakeholders should collaboratively decide whether this warrants business model redesign or whether this can be resolved for the current BM.

Workshop 6 – Reflection and next steps concludes the core sustainable collaborative business modelling process. Here, the consortium reflects on the decision made and plans the next steps towards execution. In case business model tests are specified (to validate assumptions uncovered through BRM) these serve as the starting point for further business model refinement or implementation.

Workshop 7 (Ad-hoc) – depending on the next steps towards execution, a deepening of previous exercises or a concretization of the execution strategy can be considered. Accordingly, this workshop may entail (not being exclusive to) supporting the quantitative business case analysis of the SCBM or may cover drafting a roadmap including concrete next actions to support the implementation of the SCBM.

2.6 How to start the use of the SCBMI?

The following requirements should be in place before the SCBMI approach can be started:

1. **Ensure that all relevant stakeholders involved for the innovation initiative are represented.** As SCBMI calls for a holistic perspective on agri-food value chains, it is important that, in order to use the SCBMI, representatives of *all* stakeholders in the value chain under consideration should be involved (at least those that will be affected or affect the innovation at play). This is imperative to understand the different motivations and drivers that exist for stakeholders present, which becomes important later on to establish a common (sustainability) goal to achieve as part of SCBMI.
2. **Appoint a facilitator to guide the SCBMI approach.** The use of a facilitator can significantly help the application of the SCBMI approach. They can act as coordinating party that drives discussions on the various aspects of SCBMI between stakeholders, facilitating the exchange of and aggregation of information to support design decision making. Decision making can also be escalated to the facilitator in case stakeholders fail to reach an agreement on design decisions. In such settings, the facilitator will take into account the various perspectives of stakeholders and drive decision making accordingly. The facilitator should schedule workshops with stakeholders to work on SCBMI. They should have both hard and soft skills (i.e. knowledge on business modelling as well as orchestration capabilities) to guide the workshops. Note that the facilitator should be a trusted and independent stakeholder to support the exchange of information between innovation initiative stakeholders.
3. **Touch base with each stakeholder individually before the start of SCBMI.** It is important to understand the different drivers and perceptions of stakeholders involved before commencing the SCBMI process. This is especially important in innovation settings in which stakeholders have not previously collaborated before or innovation settings which are characterized by significant competition. It is important to elicit and collect these individual drivers and perceptions to ensure that potential conflicts of interests between stakeholders can be addressed as soon as possible before work on sustainable collaborative business modelling takes place. Aligning these drivers and perceptions early on reduces the risks of failing to achieve collaborations later on for the SCBMI process. In addition, it is also important to understand the role of the stakeholders involved respective to their organization. For example, what position do they hold for the organization and what decision-making power do they have?
4. **Execute the workshop plan.** Once each stakeholder is onboarded, the workshop plan defined by the facilitator can be executed. Through this workshop plan, the SCBMI process takes place, bringing together stakeholders to discuss opportunities, challenges and business models towards creating sustainable impact through digital innovations.

2.7 How to monitor and continue an innovation initiative?

Once the phases of the SCBMI approach have been completed, stakeholders can work towards the operationalization and scaling of the SCBMI. Depending on the maturity of the innovation initiative, resources (financial, human, technical) have to be mobilized and used to support this step. It may also entail stakeholders shifting business practices to support the new business logic of the SCBM. At this moment in time, it is important to consider how the SCBM will be scaled. This is part of the *monitoring phase* reflected in Figure 2. Several options may be considered here:

- On the one hand, stakeholders may decide to opt for a full-scale deployment of the SCBM. This strategy is particularly relevant in case no previous business model is in place, in which case the SCBM serves as the basis for future income streams. For example, it may concern the realization of a business model centered around a sustainable restaurant experience. This calls for upfront investments to be made in terms of building and machinery necessary before the SCBM can be operationalized. In this strategy, the SCBM is rapidly scaled, which enables stakeholders to quickly capture income streams once operationalized. However, it does pose business risks, as assumptions made as part of the SCBMI cannot (or only in a limited sense) be validated beforehand.
- On the other hand, stakeholders may decide to conduct experiments with the SCBM, resulting in a small-scale deployment of the business model to ‘test’ whether assumptions made were correct and whether the business model works as intended. This strategy works well when an original business model is already in place, as it allows stakeholders to generate income streams in parallel to the development of the new SCBM (Osterwalder et al., 2020). It may also reduce the risk for stakeholders to invest in a new SCBM (as stakeholders are supported through other active business models). Once these assumptions are validated and the business model performs as expected, the business model design can be scaled iteratively, either by expanding on its current user base gradually or by diversifying the service or product offered to consumers.

Whatever strategy is selected, it is important to monitor whether the SCBMs yields a beneficial scenario for all stakeholders involved (i.e. contributes to mutual value creation). If stakeholders drop out or fail to capture sufficient value, it may warrant business model redesign, which kickstarts the SCBMI approach (again). Alternatively, stakeholders may identify new opportunities to create value or are pressured by the ecosystem in doing so. As a result, the SCBMI is reinstigated, following the phases as indicated in Figure 2.

2.8 What are potential starting points that affect the flow of SCBMI?

Before commencing the SCBMI approach, it is worthwhile for innovation initiatives to consider their maturity in terms of technical, behavioural and business maturity. The respective maturity for these pillars can significantly impact the focus of phases for the SCBMI phase.

For example, in case an innovation initiative starts from scratch in terms of business modelling (i.e., there is no previous business model in place), but is mature in terms of its digital innovation, it can dedicate its efforts towards exploring changes in business and behavioural practices as part of the *analysis, design and evaluation* phase of the SCBMI approach, and align this with the development of the digital innovation. This is often the result of a *technology-push scenario*, in which a technology is available for which an innovation initiative seeks to explore how value can be created through its use. It therefore takes the digital innovation as a starting point and investigates what implications this may have for business models and behaviour.

Conversely, if an innovation initiative is already supported through an operational business model but is investigating how pending needs of consumers or stakeholders can be addressed through digital innovations, the focus for SCBMI phases shifts towards understanding the role of new digital innovations in satisfying consumer or stakeholder needs. This scenario is characterized as a *market-*

pull scenario: here, the starting point represents establishing new value propositions to address the needs and objectives of stakeholders.

Lastly, innovation initiatives may also consider expanding on an operational business model, supported through one or more digital technologies. In this case, the SCBMI would particularly be geared towards evaluating how the both business model and technology can be scaled to create additional sustainable impact, as well as identify what changes in behaviour are needed to enable this. Given the fact that the business model and technology are more or less concrete, increased emphasis can be given towards later phases of the SCBMI approach.

To further support the use of the SCBMI, we propose a characterization of innovation initiatives, as further illustrated in Figure 3. One can see that the three scenarios described above are captured as ‘innovation structures’ which describe what purpose an innovation initiative has to conduct SCBMI. It also describes the general characteristics such an initiative would have as well as the expected outputs for the SCBMI approach. Users of the SCBMI approach can use this characterization to understand what phases are most important to consider for SCBMI, as well as pinpoint what pillars (technology, business, behaviour) require the most emphasis as part of SCBMI. It should be noted that it is still worthwhile to conduct all phases of the SCBMI, as it helps stakeholders to (re)align on the needs and objectives for pursuing SCBMI.

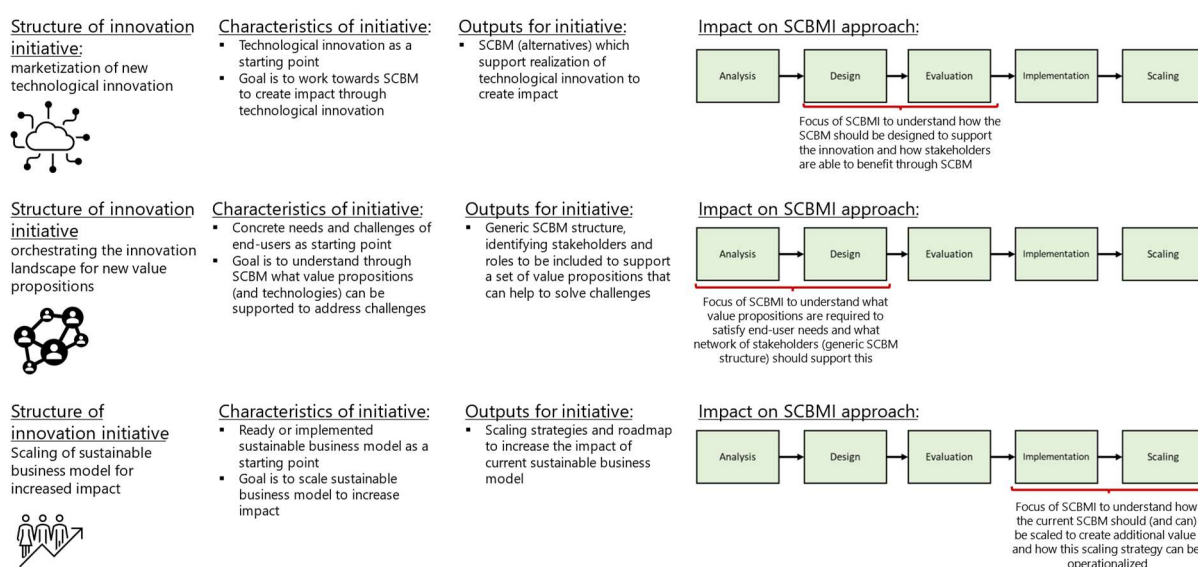


Figure 3 – Importance of SCBMI phases for different innovation structures

2.9 How does SCBMI work in practice?

To illustrate in brief how the SCBMI approach can be employed, we build upon the learnings generated through application. Specifically, we present findings generated through the SCBMI approach for an innovation initiative focused on vineyard sustainability (see Text Box 2), which focuses on the introduction of digital innovations to support vineyard farmers in the Puglia region in Italy to deal with environmental challenges as a result of adverse weather conditions (droughts, heavy rain). We illustrate what insights each phase of the SCBMI helps an Italian innovation initiative to protect vineyard farmer against adverse weather conditions using a dashboard and parametric insurance in building and developing a sustainable collaborative business model to achieve sustainable impact as well as help farmers to improve their relative position for existing value chains.

Analysis phase

In the analysis phase, the Italian vineyard innovation initiative brought together stakeholders relevant to consider as part of SCBMI. Given the intended solution (decision support system (DSS) coupled to a parametric insurance service), the innovation initiative constituted of stakeholders such as the vineyard farmers, farmer cooperative, technology service provider (DSS), insurance service provider and insurers. Each of these stakeholders indicated its objectives and needs in regards to a new SCBMI. For example, farmers expressed the challenges and negative effects on performance generated by adverse weather conditions, which they desired to overcome. For the technology service provider (which already collaborated with vineyard farmers) its objectives were twofold, namely to support farmers and contribute to sustainability but to also establish long-term financial relationships with these farmers. Conversely, for insurers, the realization of parametric insurance in practice could help them overcome inefficient and long insurance procedures which often generated significant handling costs. It also sparks a new opportunity to collaborate with farmers (and to expand on this offering).

These individual objectives were merged under the common goal that the farmer should be *better off* through the new SCBM, to which all stakeholders could agree. In response, the innovation initiative explored how the solution (DSS + parametric insurance) would create value for the farmer, as well as what behavioural and technical challenges would be faced by the farmer when using the solution in practice. This helped to identify that digitization can pose a barrier for farmers which are less tech-savvy. It calls for a DSS and parametric insurance service which are easy-to-use and intuitive. Logically, the solution should also contribute towards long-term savings for the farmer (i.e., the long-term benefits of using the solution in terms of premium prices or stability of sales should outweigh the cost of accessing it). It also highlighted the need for a clear understanding of how parametric insurance takes place, and what contracts should be defined to support this collaboration between farmer and insurance provider. The insurance service provider (a role fulfilled by a knowledge institute) or cooperative could act as a trusted intermediary here.

Text Box 2 – Protecting and supporting vineyard farmers in Puglia against adverse weather conditions

This Italian vineyard innovation initiative focuses on vineyard farmers in the Puglia region in Italy. In addition to farmers feeling market pressure to produce (and sustain) high outputs of high quality grapes for the production of wines, these farmers also face environmental challenges which pressure their cultivation practices. More specifically, adverse weather conditions such as drought or heavy rain negatively impact the cultivation and harvesting practices of these farmers. As a result, they are often not able to achieve the quality demands from the market or able to sustain the yield required to support their business operations. Although farmers can insure themselves against these conditions, such insurance claims tend to be difficult as clear evidence is missing or take long to process. Accordingly, farmers face significant problems in terms of their (financial) liquidity and working capital to sustain business operations.

To address these challenges, the Italian vineyard innovation initiative works on the realization of decision-support systems (DSS) for farmers to help them counteract the negative effects of weather. Such a DSS provides daily information and advice to farmers on how to preserve the quality of their produce as well as how the yield of the produce can be maximized whilst monitoring weather conditions. It does so through monitoring data inputted by the farmer as well as data collected through soil and weather sensors, and aggregating this data to generate an advice to farmers on how to proceed. It therefore helps farmers in improving their produce over time.

In addition, this DSS is coupled with a so called *parametric insurance* service, which uses the data generated by the DSS to support automated insurance claims. The DSS can ‘predict’ the *expected* yield by farmers if farmers comply with the regular advice given. Accordingly, if the *actual* yield generated by the farmer differs from this *expected yield* (which is often the result of adverse weather conditions or diseases), the farmer is automatically protected against this potential loss of sales. Accordingly, the parametric insurance service leverages the data collected by the DSS as proof to validate insurance claims as well as to accelerate the payment for insurance claims. As a result, farmers can more quickly use these payments to support their day-to-day practices.

Design phase

In the design phase, the inputs generated through the analysis phase served as the basis for business model design. Through a set of interactive, collaborative workshops between the Italian vineyard innovation initiative stakeholders, the configuration of the collaborative business model was ideated, taking into account the needs of individual stakeholders as well as working towards achieving sustainable impact and creating a beneficial position for vineyard farmers. Here, the role of each stakeholder, as well as the logic by which value is created and captured, was further developed.

It was determined that the solution can be costly for low-income farmers, reducing the potential for adoption in the Puglia region. To mitigate this challenge, the farmer cooperative (which expressed a desire to help its farmers) would support the financing of the solution. Accordingly, farmers interested in using the solution offered would pay a small fee to the cooperative (relative to their income), such that the cooperative would then be able to finance the solution for all farmers associated to a cooperative. Since this resulted in increased demand for the solution offered, the technology service provider would even be willing to lower the subscription fee through this structure, further stimulating adoption. It does however mean that farmers have to be associated with a cooperative, and that the cooperative must be willing to engage in this payment scheme with the technology service provider.

In addition, to further stimulate adoption of the solution, other sources of income for the farmer were explored as part of this phase. Since farmers through use of the solution would be able to provide transparency on their cultivation practices, sustainable efforts as part of their cultivation practices could potentially be monetized. To this end, the technology service provider sought after a service to support carbon sequestration (storing carbon for the soil), such that farmers can sell off carbon credits (monetization of carbon stored for the soil) to other parties to generate additional income. This required a collaboration between the technology service provider and carbon credit platforms, such that farmers can sell carbon credits for these platforms to interested buyers wishing to compensate CO₂ emissions.

Accordingly, the role of the technology service provider would act as a hub or platform for the farmer, connecting farmers to the DSS (and to receive advice on cultivation practices), to parametric insurance services (to protect against adverse weather), and to carbon credit platforms (to sell off carbon credits earned). Through the subscription fee paid by cooperatives (representing farmers), the technology service provider would be able to pay for these collaborations. Note that the cooperative or parametric insurance provider (and by extension the farmer) still interacts bilaterally with insurers to set up insurance contracts, and that using this insurance service is optional for farmers.

The division of roles and responsibilities was captured as part of a sustainable collaborative business model design, which served as input for the next phase.

Evaluation phase

In this phase, stakeholders of the Italian vineyard innovation initiative jointly evaluated the sustainable collaborative business model design, reviewing different aspects such as the desirability, viability, feasibility and robustness of the business model design. Here, the Ploutos Principles (mutual value, scalability, farmer-centricity and multiple values) were taken into account to structure this. In terms of desirability and viability, stakeholders determined the SCBM to be appropriate (in a qualitative sense): the support in place to support low-income farmers as well as the opportunity to create additional value through carbon credit sales helped to make the proposition to farmers attractive and to stimulate adoption. The technology provider indicated that it did not foresee issues to sustain operation of the platform based on the income generated through subscription fees paid by farmers

/ cooperatives. A similar positive business case was identified for the parametric insurance service providers and insurers: the parametric insurance service provider would help insurers to be onboarded for the solution offered, for which a small fee is charged. Subsequently, insurers can get in touch with farmers to establish insurance contracts build upon parametric insurance principles.

From a technical and legal perspective, some issues still had to be resolved. Parametric insurance is a new concept which is not yet employed nor is it supported through laws and regulations. Although initial trials seemed promising, clear actions were identified to engage with policy makers and insurers to further concretize the ruling around parametric insurance to ensure it can actually be used in practice. In addition, it was also identified that to sell carbon credits, certification providers should be involved, as certification of carbon credits is needed to sell off carbon credits. The technology provider would bilaterally arrange this as part of the solution offered to farmers.

Based on the evaluation and next steps identified, the stakeholders deemed the SCBM to be worthwhile to realize in practice, starting from an initial set of farmers associated to the cooperative and expanding through trial-and-error learning.

Implementation phase

The implementation phase entailed committing resources towards realizing the solution in practice. This also entailed defining a roadmap (with clear actions) with regards to when milestones towards realizing the SCBM in practice should be achieved. As identified in the evaluation phase, the insurers, insurance service providers and policy makers would come together to formalize the working of parametric insurance, such that the service can legally be offered in practice. On the other hand, the technology service provider would establish contracts with carbon credit platforms and certification providers such that carbon credits earned can be sold. For cooperatives, it meant engaging with its farmers to explain the value of the solution, to generate willingness of farmers to participate, and to connect farmers to the solution.

Scaling phase

With the initial pilot in place, the Italian vineyard innovation initiative measured the performance of the SCBM, looking at its impact on sustainability as well as the degree to which value is created for farmers. For the former, it identified that inputs such as water, fertilizer and pesticides can be reduced as a result of DSS use, which has a positive effect on emissions as well as soil quality. This meant that the solution was working ‘as intended’ and that the solution could be scaled to other farmers. For the latter, it elicited feedback of farmers using the solution and the value that it created for them. Initial trials demonstrated that farmers would generate savings through using less inputs. They were also better able to control or predict the yield of the produce, enabling farmers to sell off increased yield to their customers. From this point onward, the Italian vineyard innovation initiative gradually intends to scale the solution further by attracting additional vineyard farmers as part of the solution. It also intends to develop different finance schemes for vineyard farmers not associated to a cooperative.

3 How can I support SCBMI?

In this section, we detail the tools that users of the SCBMI have at their disposal to support in the application and execution of the process. For these tools, we delineate between the following set of options, as illustrated in Figure 4:

- Tooling the support the **exploration** of sustainable collaborative business models. This helps users to get inspired on potential (reference) solutions regarding SCBMIs. It lists options available to users that can be used to further concretize their respective SCBM, given the characteristics and conditions for their pilot setting.
- Tooling to support the **design** of sustainable collaborative business models. This helps users in guiding the configuration of SCBMIs, paying attention to how aspects of the SCBMI can be represented and communicated upon.
- Tooling to support the **exploitation** of sustainable collaborative business models. This helps users to investigate and explore alternative means of value creation and capture which can be embedded for SCBMs. It provides a framework to analyse how data is used to generate benefits for stakeholders in SCBMs, and to what extent these benefits are one-sided, two-sided or collaborative in nature. Through analysing value exchanges using the framework, the SCBMs can be further refined, as it provides insights on how stakeholders will benefit through collaboration. Alternatively, it can help to shed light on transactions which should be in place to capture value.

In the following, we describe each set of options available for the user to support SCBMI.

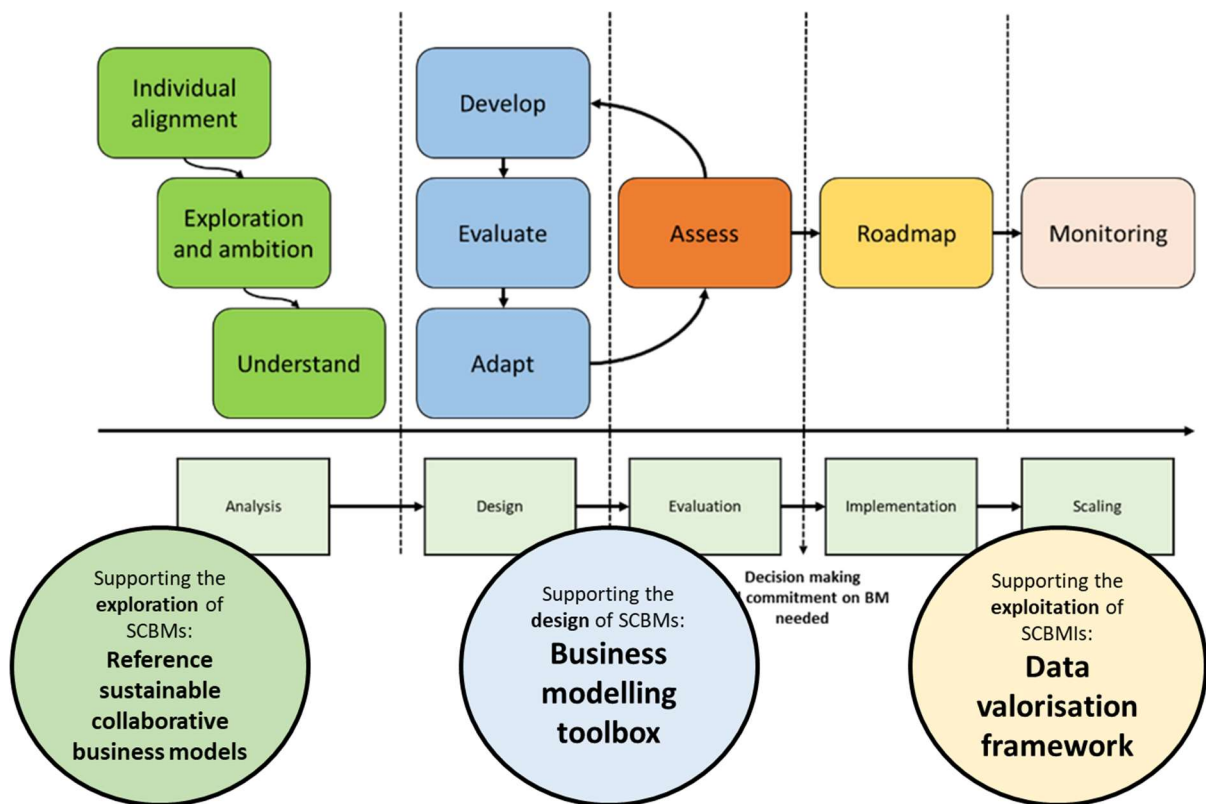


Figure 4 – Tools available to support SCBMI

3.1 How can I support the exploration of sustainable collaborative business models?

The SCBMI process is a creative process, in which stakeholders as part of one or more value-chains co-create and design collaborative business models towards sustainable impact. Although each innovation initiative is different in terms of solution proposed, stakeholders involved and ecosystem conditions at play (and therefore always require a business model design customized to the characteristics of the innovation initiative), stakeholders can learn from (generalized) best practices regarding sustainable collaborative business modelling. Successful sustainable collaborative business models, both past and present, can help stakeholders get inspired or can provide handholds to stakeholders on how to customize their own business model design. It can help to learn from other innovation initiatives on how these initiatives addressed core challenges such as financing or rebalancing value chains relevant to farmers. Such example business models can also shed light on how sustainable activities by farmers can be remunerated or how additional value can be captured by farmers. Summarizing, looking at past and present (successful) sustainable collaborative business models can be a fruitful starting point for innovation initiatives to develop their respective collaborative business models.

To support the exploration of sustainable collaborative business models, we therefore advocate the use of *reference sustainable collaborative business models*. In the following, we detail what reference business models exist in the context of the agri-food domain and how they contribute towards sustainable impact.

3.1.1 What are typical agri-food sustainable collaborative business models?

Table 1 presents an overview of the set of reference sustainable collaborative business models identified through a systematic review of relevant literature as well as building on practice case studies. One can see that seven archetypes (including sub-archetypes) are identified to which the reference SCBMs belong, namely:

Table 1 - Set of reference sustainable collaborative business models in the agri-food domain

Main archetypes	Maximize material and energy efficiency	Create value from waste	Deliver functionality rather than ownership	Adopt a stewardship role	Re-purpose for society	Shorten the value chain	Support financial stability
Sub-archetypes	Aligning supply and demand Improving through transparency Data-driven farm optimization	Farming on food waste Valorising farm waste Marketing blemished and surplus food	Farming equipment as a service Agriculture 4.0 as a service Farming as a service	Transparent farming practices	Payments for eco-system services	Cooperative food processing Cooperative branding Cooperative sales Cooperative purchasing B2B marketplace B2C marketplace	Parametric insurance Collaborative financing

- **Maximize material and energy efficiency:** this archetype covers business models which aim to reduce farmer inputs and farm waste through collaboration. They aim to improve the performance of existing business models rather than adopting new business models. The sub-archetypes as illustrated in Figure 5 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Aligning supply and demand	Establish vertical collaboration between farmers and buyers (retailers, HoReCa) to share information on demand and supply.	Better alignment leads to less waste and potential to sell larger proportion.	Bon Harvest (USA) employs inventory management systems to improve collaboration between farmers and HoReCa
Improving through transparency	Collaboration between farmers to share data on performance and best practices to benchmark against other farmers	Best practices can help farmers improve performance and reduce inputs needed or achieve better quality produce	My Dairy Dashboard (USA) is a platform which connects farmers and enables data sharing on dairy farming and milk production
Data-driven farm optimization	Horizontal collaboration between farmers and service providers to optimize farm performance. Data is collected at farmers and analysed by service providers to provide data-driven advice.	Advice and insights enable better farm performance (decreased inputs, higher quality outputs).	Apiary Book (UK) helps beekeepers to monitor and analyse data of bee colonies to support their management.

Figure 5 – Sub-archetypes for 'maximize material and energy efficiency'

- **Create value from waste:** this archetype covers business models which aim to reduce (farm) waste through collaboration. The “create value from waste” business models can be added on top of existing business models but, in contrast with the “maximize material and energy efficiency” business models, they are not aimed at incrementally improving the existing business models but, rather, to add new activities to the business model. The sub-archetypes as illustrated in Figure 6 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Farming on food waste	Horizontal collaboration between farmers and food waste producers (restaurants, food processors) to turn food waste into valuable end-products	Farmers generate additional income streams through material otherwise destroyed or wasted.	HaagseZwam (The Netherlands) grows oyster mushrooms on residual coffee grounds
Valorising farm waste	Horizontal collaboration between farmers and agri-food processing companies to turn waste into inputs for other industries	Farm waste can become an additional income stream	Ecoyon (Ghana) turns coconut husk and sugar cane waste into wood alternatives
Marketing blemished and surplus food	Horizontal collaboration between farmers and platforms to sell blemished or surplus produce	Enable sales of surplus food and remove the need to cover disposal costs for surplus food	FoodMesh (Canada) is a marketplace that matches surplus food to businesses and charities

Figure 6 – Sub-archetypes for 'create value from waste'

- **Deliver functionality rather than ownership:** this archetype covers business models focus on shifting towards a service model by delivering or using the function of the product rather than the ownership. The sub-archetypes as illustrated in Figure 7 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Farming equipment as a service	Horizontal collaboration between farmers and equipment owners to use farming equipment without making capital investments	Increased available working capital for sustainable farming, decreased risk and increased flexibility	FarmSpark (Nigeria) is a platform which connects farmers to agro-service providers such as rental vendors
Agriculture 4.0 as a service	Horizontal or vertical collaboration between farmers, agronomists and technology providers to leverage agriculture 4.0	Increased working capital, decreased risk and increased flexibility, data-driven insights to improve performance	AgromelO (Brunei) collects data from farm systems to provide customized solutions and monitoring to improve farm performance
Farming as a service	Vertical collaboration between farmers and consumers, in which farmers do not sell products but rather sell farming services (in which case the consumer is owner of the end-products)	Stable income due to upfront payments, improved relationships to consumer	VinX (Israel) are wineries which sell wine futures. Consumers receive bottles from their own parcel including certification

Figure 7 – Sub-archetypes for 'deliver functionality rather than ownership'

- **Adopt a stewardship role:** this archetype covers business models which focus on engaging with stakeholders and consumers to ensure their long-term health and well-being. In the context of farming and collaborative business models, farms can adopt a stewardship role by providing insights on the food to the buyers. The sub-archetype as illustrated in Figure 8 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Traceable farming practices	Vertical collaboration between farmers and other value chain actors and horizontal collaborations with platform providers to enable traceability of food products for the value chain.	Access to premium prices as quality and sustainability guarantees can be presented to consumers	WhatsHalal (Singapore) represents a value chain collaboration using blockchain technology to provide traceability on halal meat

Figure 8 – Sub-archetype for 'adopt a stewardship role'

- **Re-purpose for society:** this archetype focuses on business models which create social and environmental benefits rather than economic benefits. In the context of farming and collaborative business models, farms can repurpose their business model for society through payments for eco-services. The sub-archetype as illustrated in Figure 9 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Payments for ecosystem services	Horizontal collaboration between farmers and actors from various value chains to connect farmers to actors willing to pay for ecosystem services (for example, carbon sequestration or tree planting)	Additional income streams for farmers for ecosystem services	Treedom (Italy) enables people and companies to plant and support trees, directly financing farmers involved in doing so.

Figure 9 – Sub-archetype for 'repurpose for society'

- **Shorten the value chain:** this archetype addresses business models which are aimed at improving the economic position of farmers and to increase transparency for the buyers by removing actors from the supply chain. The sub-archetypes as illustrated in Figure 10 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Cooperative food processing	Horizontal collaboration between farmers to operate food production and processing jointly	Shared risk between farmers and decreased capital spending, improved market position due to increased scale	Bay Area Ranchers Cooperative (USA) is a cooperative for ranchers to jointly process meat.
Cooperative branding	Horizontal collaboration between farmers and vertical collaboration with value chain actors to create a common brand	Higher prices through strong brand, ability to communicate sustainable and local nature through brand	Grana Padano (Italy) is a consortium of farmers and cheesemakers which have created a premium cheese brand through shared efforts
Cooperative sales	Horizontal collaboration between farmers and vertical collaboration with value chain actors to create a shared sales channel	Higher prices and increased price control through value chain integration	Porro Cervere (Italy) is a consortium of leek farmers who jointly sell their leek on events, resulting in increased scale and attractiveness
Cooperative purchasing	Horizontal collaboration between farmers to purchase inputs and equipment together	Stronger negotiation position to equipment providers and decreased purchasing costs through scale	AF Smart Farm Procurement (UK) represent multiple farmers which make joint purchases like seeds, fertilizers and fuels
B2B marketplace	Horizontal collaboration between farmers and buyers to sell produce to wider audience, often through platform-based marketplace	Increased market access and potential for better prices due to increased scale	Agrow (Argentina) is an online platform which allows farmers to sell fruits, vegetables to food processors
B2C marketplace	Horizontal collaboration between farmer and consumer (and often involving platform provider) to sell produce directly to consumers	Increased market access and opportunity for better prices due to direct interaction with customer	Beanboat (Bahrein) is an e-commerce platform that connects coffee farmers in Colombia to consumers in the world

Figure 10 – Sub-archetypes for 'shorten the value chain'

- **Support financial stability:** this archetype covers business models which help farmers to increase or free up their working capital, which subsequently can be used to invest in sustainable practices. The sub-archetypes as illustrated in Figure 11 can be considered here.

Sub-archetype	Description	Value for farmer	Examples
Parametric insurance	Horizontal collaboration between farmers, insurers and technology providers to cover risks based on data collected at farm locations	Faster pay-out and secured income to free up working capital for other expenses	OKO (Mali) uses satellite information to define risks and create insurance products for farmers in emerging markets
Collaborative financing	Horizontal collaboration between farmers to increase scale for investments such as to attract investors	Improved access to funding or investments for sustainable production equipment, resulting in improved operating conditions	HeavyFinance (Lithuania) is a crowdfunding platform to provide loans for farming equipment

Figure 11 – Sub-archetypes for 'support financial stability'

The set of archetypes (and sub-archetypes) serve as a starting point for developing customized sustainable collaborative business models which fit the characteristics of the respective innovation initiative. Here, archetypes can be combined to create additional value streams or to address financing or adoption challenges faced. Accordingly, the archetypes serve to inspire users on how sustainable collaborative business models can be configured and designed.

Why and when should you use reference sustainable collaborative business models?

The set of reference sustainable collaborative business models can help to inspire innovation initiatives on how value can be created for farmers and how to get organized in terms of stakeholders. This is particularly useful at early phases of the SCBMI process (the **analysis** phase), in which the configuration of how organizations will collaborate to create sustainable impact (as well as through what innovations offered) is still developing. More so, certain challenges may already be apparent (for example, weak position by farmers in the value chain) which can potentially be overcome through a combination of one or more subarchetypes. The subarchetypes therefore produce valuable opportunities to further explore to create impact or value for the farmer, or may shed light on what collaborations should be established to enable a respective sub archetype.

Conversely, the reference sustainable collaborative business models can also serve as a means of reflection: if similarities in terms of configuration and value creation mechanisms can be identified between the reference options and the sustainable collaborative business model designed for the innovation initiative (for example both adopt traceable farming practices), the reference business model and associated example can be used to evaluate or further refine the designed sustainable collaborative business model. The example can provide important insights or best practices which can further enrich the sustainable collaborative business model design under consideration. As such, the use of the reference set can also support the **design and evaluation** phase of the SCBMI process.

How can the reference sustainable collaborative business models be used in practice?

We can illustrate the use of the reference sustainable collaborative business models through work conducted as part of a Cypriot innovation initiative for digital provenance of wine (further explained in Text Box 3). The Cypriot wine provenance innovation initiative focuses on the development of digital labelling for wineries in Cyprus. Using a digital label, real-time information on the wines (such as how the wines have been produced or what ingredients are used) can be communicated to consumers. This enables wineries to highlight the local and sustainable nature of the wines produced, which helps wineries to differentiate themselves from other wine producers.

To support digital labelling, real-time data is needed, which can be collected through smart farming solutions. Accordingly, wineries can purchase a *service* (which includes the smart farming solution as

well as setup for digital labelling) to support in doing so. However, particularly for smaller farmers, acquiring such a service may pose a significant financial barrier. Here, the Cypriot wine provenance innovation initiative investigated how this barrier can be overcome through learning from reference sustainable collaborative business models. In addition, the Cypriot wine provenance innovation initiative also investigated how trust for the digital label could be reinforced, learning from best practices: this trust is important to incentivize and motivate farmers to continue their purchase (being assured that a wine bottle has been produced in a sustainable manner and that it is produced locally). To this end, the set of reference sustainable collaborative business models was used.

Since there are many wineries on Cyprus which can potentially join forces and share resources to overcome the challenges posed, the subarchetypes for ‘shorten the value chain’ were considered, as these focus on reorganizing traditional value chains. Here, the following sub-archetypes were examined:

- Cooperative food processing
- Cooperative branding
- Cooperative sales
- Cooperative purchasing

The solutions *cooperative branding* and *cooperative purchasing* resonated with the stakeholders of the Cypriot innovation initiative for digital provenance of wine. Cooperative purchasing was considered in light of supporting wineries to adopt and access smart farming solutions. Accordingly, financial resources can be pooled by wineries to jointly invest in smart farming services, so as to reduce the financial barrier towards accessing these solutions. Alternatively, wineries can exchange smart farming services between wineries, so that all wineries can benefit (for example, a winery can ‘lease’ the use of a drone to another winery for a small fee – as a result, both wineries can benefit from a single solution).

The cooperative branding reference solution was selected as it allows wineries to further leverage the sustainable and local value of the wines produced. Through a common brand (which all associated wineries can include as part of their labelling), awareness on the sustainable and local character of the wines can be increased. This can help to stimulate the trust needed by consumers to continue their purchase (enabling wineries to reap value for their efforts).

Cooperative sales and cooperative food processing were deemed less applicable as sales channels were often dispersed (each winery collaborating with different retailers or having individual sales channels). Whilst collaborative food processing can help to reduce costs of operations, it did not contribute towards solving the challenges faced.

Both strategies helped stakeholders of the Cypriot wine provenance innovation initiative to further refine and concretize their respective sustainable collaborative business model, including both reference solutions as part their (new) business logic. It demonstrates how the set of reference business models can be used.

Text Box 3 – Communicating sustainability and locality through practices of digital labelling

The Cypriot wine provenance innovation initiative focuses on vineyard farmers and wineries in Cyprus. Like many markets, these farmers and wineries are pressured by competition of other wineries, especially from wines which are not necessarily produced in Cyprus, making it increasingly difficult to reap sufficient value as part of their day-to-day practices. They are in need of solutions which help them differentiate themselves from international wines and which emphasize the local nature of their personal wines to consumers. Moreover, local regulations also force wineries to transition towards sustainable cultivation practices. Wineries should be able to communicate how wines have been produced to consumers, how the cultivation process has taken place and what ingredients are used.

To support wineries in overcoming these challenges, the Cypriot wine provenance innovation initiative investigates the use of smart farming solutions which collect and aggregate data on how cultivation practices have taken place. Accordingly, data is collected on aspects such as soil conditions, fertilizer and water use as well as spraying and pesticide use. Wineries can use this data as a means of ‘proof’ to consumers: they can explicate in a traceable way how wines are developed from farm-to-store. This also enables wineries to communicate the sustainable nature of their wines, demonstrating that less fertilizer is used or grapes have been cultivated using less natural resources.

However, there is a clear gap between raw data produced through smart farming solutions and data which holds actual value to the consumer. To bridge this gap, the concept of digital labelling is developed as part of the Cypriot wine provenance innovation initiative: it entails the (often real-time) inclusion of data generated through smart farming solutions as part of the label on wine bottles. Accordingly, by means of a QR code which can be scanned, consumers can receive information on how the wine has been produced, where it has been produced and how it contributes towards sustainable impact. As a result, the digital label can help create trust for consumers and enable wineries to differentiate themselves from (international) wines. This also enables wineries to comply with regulations as it offers traceability on what ingredients are used for the cultivation process.

To support digital labelling in practice, some challenges need to be overcome. From the technical perspective, wineries should possess or be able to access smart farming solutions in order to generate data to support digital labeling. This can prove a barrier specifically for smaller wineries. Conversely, from the consumer perspective, it is important to understand what data the consumer actually values, and how this information should be communicated to stress the sustainable and local nature of the wines. Here, establishing trust and loyalty of consumers is important to truly capture value through digital labelling – the label should actually mean and reflect values which resonate with the consumer.

What recommendations and tips can be given when using reference SCBMs?

The reference SCBMs can be summarized by means of the training card illustrated in Figure 12, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.

Set of reference sustainable collaborative business models

What	Set of reference business models based on best practice and learnings which explain how different collaborations can be formed or used to achieve sustainable impact and to support rebalancing agri-food value chains. The set of reference business models is divided into seven archetypes (each including sub-archetypes) to help inspire users on how they can innovate their business models
When to use	• Goal: The set of reference SCBMs helps users to inspire or concretize their respective SCBM through learning from best practices and practical examples. It provides a catalogue of different solutions towards sustainable impact which users may consider to innovate their business models • Stage(s): The set of reference SCBMs is typically used in the analysis or design phase of the SCBMI process • Type: Brainstorming session(s) and co-creation workshop • Time effort: 2 hour workshop per iteration, until one or more solution directions are considered worthwhile to explore further. Time effort depends on whether all archetypes should still be explored and considered or whether certain archetypes are already preferred given the characteristics of the innovation initiative.
How to use	• Appoint a facilitator to describe the set of archetypes, their implications for collaboration and impact on value capture and sustainability. • [Facilitator] If online, prepare a Miro board to support discussion. If offline, prepare a whiteboard which lists the archetypes available • [Facilitator] Invite stakeholders relevant to consider for SCBMI, which can indicate whether archetypes make sense in the context of the to be designed SCBM for the innovation initiative • [Facilitator] Engage all stakeholders – make sure a safe and participative climate is achieved • [All] List the challenges faced for the SCBMI – what problems do we intend to solve or what opportunities do we wish to capture? Are the problem / opportunity owners clear and agreed upon? • [All] Go through the set of reference SCBMs to identify solution directions which could help in solving the problems or opportunities identified. Use the examples included to get inspired and to reflect on whether it would work for the setting in which the innovation initiative is positioned. Work from archetypes towards sub-archetypes in doing so. • [All] Vote or determine which (set of) archetypes (and associated subarchetypes) are preferred. Ensure consensus is achieved. • [Facilitator] Note and summarize the findings of the workshop. Consider the archetypes as input for a follow-up SCBM design workshop
Strengths	• The set of reference SCBMs offers diverse solutions towards creating impact or dealing with agri-food value chain challenges. It can help to inspire users to think outside of the box. • The set of reference SCBMs is simple in use. It serves as a catalogue of options which users can consider for their respective SCBM. The examples help to make things practical. • The set of reference SCBMs works well to jointly discuss the value of adopting one or more archetypes (sub-archetypes). It does not impose any structure, meaning that users can freely go through the set of options available or revisit options at a later point in time. • The solution direction can serve as a starting point for SCBM design. It enables users to fill in parts of the SCBM based on the descriptions offered.
Weaknesses	• The reference SCBMs only provide solution directions, and do not explain <i>how</i> it should be realized in practice for the respective innovation initiative. It also does not offer guidance on the circumstances for which an archetype is best applied, and may result in an archetype being selected which turns out not to be valuable or feasible. These design decisions are still up to the user. • Combining archetypes (or sub-archetypes) can be difficult, as it means that many collaborations should be formed and managed (which may cause conflicts or may require separate business models). Given the abstract descriptions included for the reference SCBMs (to inspire and increase their ease-of-use), they do not indicate how such difficulties may be solved.
Tips	• It is important to identify what problems, challenges or opportunities you want to address through SCBMI, and to have these in mind when going through the archetypes. As each archetype has their merits, it can become difficult to navigate or select between the many alternatives. Understanding <i>why</i> you are conducting SCBMI (and which problems or opportunities you are concretely addressing) can help to more quickly identify which subarchetype(s) best work for your innovation initiative.

Figure 12 – Training card for reference SCBMs

3.2 How can I support the design of sustainable collaborative business models?

The design of SCBMs can be supported through a toolbox of methods used in the context of business modelling, which address different aspects of SCBMs. In the following, we introduce the following tools at the disposal of users of SCBMI:

- Value Proposition Statement
- Customer Journey
- DAMIAN
- Service-Dominant Business Model Radar
- Benefits Realization Mapping

Per tool, we indicate to what purpose these are used. We also illustrate the use of the tools through practical examples taken from the agri-food domain.

3.2.1 Value Proposition Statement: how can I communicate the value of my innovation simply?

A **Value Proposition Statement** helps users to define, visualize and concretize the value of a new technology, product or service. It is template-based tool which helps users to specify:

- The technology, product, or service they are offering
- The customer segment relevant for this offering
- The problem, challenge or opportunity faced by the customer segment
- The logic by which the offering *takes away pains* or *satisfies needs* to address the problem, challenge or opportunity

Filling in the value proposition statement should result in a description of how a new technology, product or service will create value for a customer segment and why this is the case, providing a narrative of how an offering will work in practice. It helps to communicate to others what this product or service constitutes and with what purpose. Typically, different combinations of offerings and customer segments warrant users to fill in additional value proposition statements: changes to the offering may result in additional or different value for customer segments when used; alternatively, different customer segments may have different needs or face different challenges. Therefore, in case various offering-customer segment combinations exist, the value proposition statement may be reused to clarify the differences between them.

A brief video-based walkthrough on how the value proposition statement is used can be found here:

https://www.youtube.com/watch?v=pwjG-MwaVCo&ab_channel=PloutosH2020

Why and when should you use the value proposition statement?

Offering a new technology, product or service to users does not necessarily mean it will create value when marketised. Even if a novel offering seems promising and valuable on paper (in the eyes of those offering it), it is important to consider why this is the case and to clearly define how such an offering will be used in practice. It requires a careful consideration of *who* will use this offering and *why* they intend to do so. It calls for explicating *what value* is created through use of the offering and because of what reasons (taking away pains versus creating gains). A misalignment between offering and customer segment can result in offerings not being used in practice, as customers do not see the value

of using it. This means that investments made towards developing the offering are wasted, which can be costly. It could also mean that organization(s) can not work towards achieving (sustainable or societal) impact, as the offering is not used in practice. A value proposition statement can give quick insights on the combination of offering-customer segment. It can help users to evaluate whether the intended positioning in the market of the offering makes sense and for what reasons the offering is expected to create value for a chosen customer segment.

The value proposition statement is best used in early phases of the SCBMI process (analysis phase): it offers a high-level perspective on how new innovations will create value for a specific customer segment. It is important that the alignment between innovation and customer segment is evaluated early on, such that any issues or challenges can be addressed before further concretization of the innovation takes place (which evidently is more costly). The value proposition statement offers a quick yet effective means of doing so: through joint discussion and evaluation on the value proposition, a mismatch between offering and customer can be quickly identified. Consequently, either the offering can be adjusted or different customer segments can be considered.

How is the value proposition statement used in practice?

We can illustrate the use of the value proposition statement through an agri-food case study based in the Netherlands (this case study is further explained in Text Box 4). In this case study, ZLTO, an association for farmers and growers in the Netherlands, explores the development and marketization of a carbon sequestration service to its farmers to support sustainable farming. To overcome the financial barrier for adopting the service, ZLTO intends to connect farmers to organizations willing to buy carbon credits: accordingly, farmers can sell of carbon credits generated through carbon sequestration to such organizations to generate return on investments to finance the use of the service. Logically, using the carbon sequestration service will also contribute towards sustainable farming practices as well as a healthier soil, providing further benefits to the farmer. However, it is important to investigate how the offering will align with the motivations and drivers of both farmers and organizations involved. Therefore, to better understand the targeted customer segments and the role of the proposed carbon sequestration service in creating value for these customer segments, the value proposition statement tool is used. The value proposition statements for the farmer and the organization purchasing carbon credits are illustrated in Figure 13 and Figure 14 respectively.

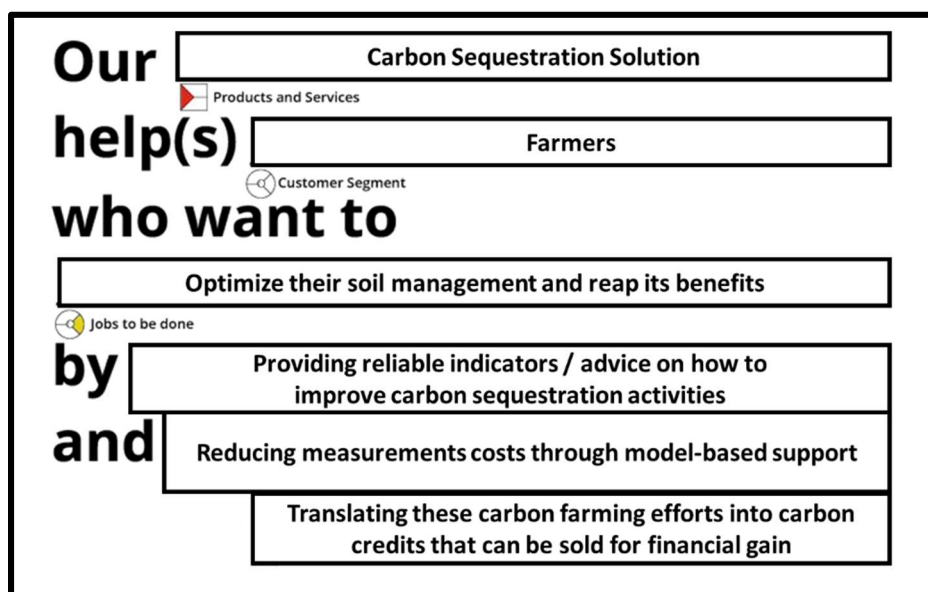


Figure 13 – Value proposition statement for carbon sequestration service to farmers

Text Box 4 – Providing carbon sequestration services to support sustainable farming impact and financially support farmers

The Dutch innovation initiative to support carbon sequestration is based in the Netherlands and revolves around ZLTO, an association for farmers and growers based in the south of the Netherlands. The purpose of ZLTO is to represent and support farmers and growers in sustaining, but also innovating their day-to-day farming and cultivation practices. To do so, ZLTO provides advice and counseling services as well as seeks out funding opportunities which farmers and growers can leverage to support innovation activities to improve on their current practices. As is the case in many countries, farmers and growers in the Netherlands face regulatory challenges geared towards addressing climate change and environmental effects – as a result, farmers are required to transition towards sustainable farming practices over time.

One measure that can be considered here is the use of carbon sequestration: (the process of) storing carbon for the soil. Carbon sequestration can help to reduce carbon emissions, contributing to reducing its impact on climate change. In addition, carbon enriched soils also require less inputs (such as fertilizer or water), further contributing to the sustainable nature of the farming practices.

As part of the Dutch carbon sequestration innovation initiative, ZLTO actively investigates how such a service can be offered to its farmers to stimulate more sustainable farming practice, and to explore how such a service can create value for farmers. A challenge to overcome here is the fact that carbon sequestration services tend to be costly: this could reduce the likelihood that farmers will adopt such services. However, using such a service would also enable farmers to generate *carbon credits*: permits to emit a certain amount of CO₂ or greenhouse gases. These carbon credits can be traded with organizations or institutions interested in moving towards sustainable business practices. Accordingly, farmers can generate a return on investments through carbon farming. Here, connecting farmers to organizations within the same or similar value chain can spark further collaboration between both stakeholders. It is evident that for such a carbon sequestration service, it is important to investigate how this service will be marketized. It calls for an investigation of how carbon sequestration services (and the generation of carbon credits) can help both farmers and (value chain) organizations to address their challenges or opportunities.

The value proposition statement *to farmers* indicates that in terms of customer segment, farmers are targeted which are *interested in optimizing their soil management / striving for sustainable farming practices*. This is explicitly considered as it will take time before carbon sequestration services generate return on investments (either through carbon credit sales or through improved soil conditions). Accordingly, there should be an intrinsic driver for farmers to strive for sustainable business practices, which also means that the carbon sequestration service will not appeal to all types of farmers. This insight can help to better position or cater the carbon sequestration service to (sustainable) farmers – this can be used to further develop the service over time.

We can also see that the service helps farmers in providing advice on how carbon farming should be conducted, based on measurements conducted at the farm. It encompasses a solution which includes sensors and a model-based analysis tool to support carbon sequestration. Accordingly, the service supports decision making for the farmer and takes away the need for individual measurements or for farmers to involve agronomist services to support carbon farming (addressing a *pain* of the farmer).

Moreso, we see that the service also enables farmers to sell of carbon credits to achieve a return on investment (creating a *gain* for the farmer).

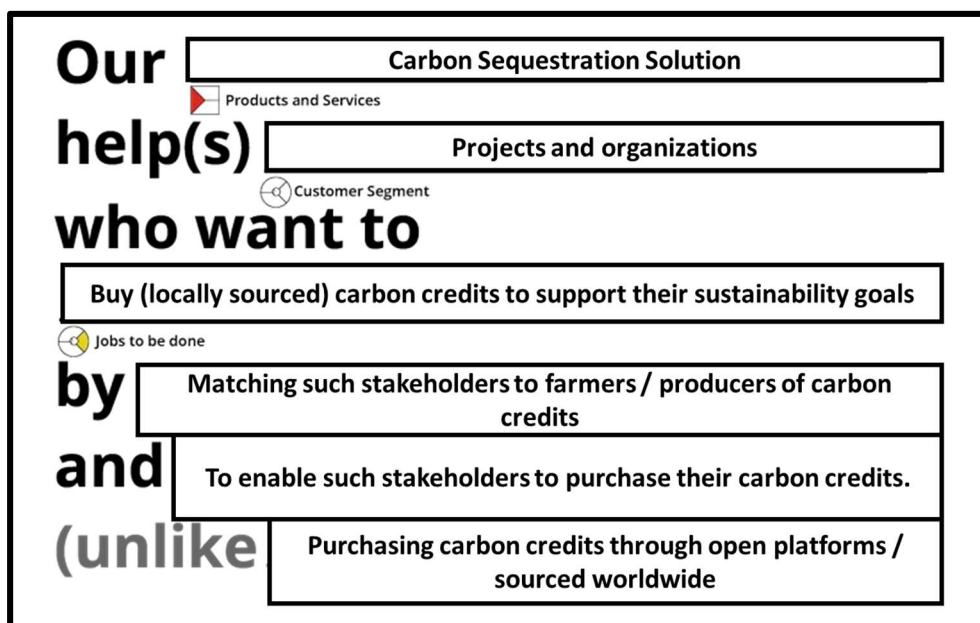


Figure 14 – Value proposition statement for carbon sequestration service to organizations

The value proposition statement *to organizations* explicates that organizations such be motivated to purchase carbon credits to support their sustainability goals. Here, the locally sourced aspect of the carbon credits can be emphasized as an additional value driver: it can help organizations to indicate where sustainable efforts have been achieved and that these local efforts are support by these organizations.

The carbon sequestration service will match or connect farmers to the respective organizations. In case the farmer and organization belong to the same value chain, the service can help to improve the relationship or coordination between both stakeholders. Since carbon credits can also be purchased through open platforms, it is important to distinguish the value of this service: it enables organizations to collaborate with farmers generating carbon credits (as opposed to the anonymous purchase of carbon credits).

What recommendations and tips can be given for using the value proposition statement?

The value proposition statement can be summarized by means of the training card illustrated in Figure 15, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.

Value Proposition Statement (VPS)

What	Tool to understand and communicate the value proposition(s) of new innovations or solutions. It represents a structured template that lists the solution under consideration, the customer or end-user segment addressed, and how the solution creates value for this segment by either removing 'pains' or creating 'gains' for the customer or end-user.
When to use	• Goal: The VPS supports users in identifying customer or end-user segments for the proposed innovation or solution and to understand the value that is created through the solution for these segments. • Stage(s): The VPS is used in early stages of the SCBMIP. • Type: Co-creation workshop (either online or offline, brainstorming) • Time effort: 30 minute preparation, 1 hour workshop (15 minute fill-in), 1 hour of recording.
How to use	• Appoint a facilitator for filling in the VPS and driving the discussion (typically the SIP leader or orchestrator) • [Facilitator] Prepare a Miro board or similar online collaboration tool that visualizes the VPS template or use a printed version of the template including post-its and pens. • [Facilitator] Invite stakeholders relevant to the working or development of the solution to join in for the workshop (e.g. stakeholders that can influence what the solution will look like and how it will work). • [Facilitator] Engage all stakeholders present – make sure that a participative and safe climate is achieved (and that there are no bad ideas) • [Facilitator] Explain the VPS template; if needed go through an illustrative and easy example. • [All] Discuss the solution and ensure that consensus is achieved on <i>what</i> the solution is and <i>how</i> it works • [All] Discuss the customer / end-user segments that fit the solution. This step can be revisited depending on whether the value created for the customer or end-user makes sense (next step). • [All] Investigate per customer segment (previous step) what <i>gains</i> are created for this customer segment and what <i>pains</i> are taken away. Then, jointly discuss whether the resulting <i>value proposition</i> is sufficient or whether the customer segment should be revisited. Conduct this step for each customer segment deemed relevant. • [Facilitator] Once a value proposition (in terms of <i>gains and pains</i>) is specified for all customer segments relevant to the solution, the workshop can be concluded.
Strengths	• The VPS forces you as a user to think about your customer or end-user: does it really need my solution? If so, how does the solution help the end-user in achieving its goals? What concrete pains and gains does it solve? • The VPS particularly enforces engineers to focus on beneficial technological characteristics, but rather to think about how these characteristics are valuable in the 'eye of the beholder' (the customer or consumer) • The VPS is simple and easy to follow (essentially only asking 5 questions related to value creation), but helps in creating alignment between stakeholders and deciding on how the solution should be shaped and for what customer segments. • The VPS can be easily used in collaborative settings or brainstorms: this can help in creating a joint understanding. • Filling in the VPS does not take a lot of time. Multiple customer segments (if applicable) can be considered in a workshop setting.
Weaknesses	• Depending on how concrete the solution already is, the VPS can 'seem' trivial. This can make it difficult to motivate stakeholders to participate ('we already know that it is valuable'), yet potential (wrong) assumptions may underlie this thinking. A strong facilitator can help to mitigate this, as well as stressing the importance of creating a shared understanding. • The VPS does not offer much guidance on the specification of value propositions. One should avoid drafting value propositions that either do not say much ('our solution provides <i>great</i> quality') or are poorly presented ('our solution offers specific characteristics that enable the customer to tweak their KPIs to help them steer business activities').
Tips	• Aim to have (a representative of) the customer or end-user at the table: this can help in quickly verifying whether assumed gains and pains are actually relevant for the customer. This works well if it is already more or less apparent what customer segment will be addressed. • For ideating customer segments and associated value propositions, each stakeholder can first individually describe what he / she thinks makes sense in the context of the solution. This can then be discussed jointly after which consensus making starts. This can help in avoiding 'group thinking' or and to give an explicit say to each stakeholder at the table. • It is a good practice to revisit the VPS later on for the SCBMIP: have our value propositions changed over time? Why is this the case? This can help in better understanding how the solution is used and whether this makes sense.

Figure 15 – Training card for the value proposition statement

3.2.2 Customer Journey: How can I understand how my innovation impacts the key process of my customer?

The **Customer Journey** is a tool used to understand the sequence of events that customers or end-users go through when interacting with a product, service, or innovation from the initial awareness stage through the final post-purchase interactions (Norton & Pine, 2013). It therefore helps in understanding how value is created (or potentially destroyed) for the customer by means of the innovation, how stakeholders are involved to support the value creation process and what information needs or assumptions can be identified as part of this value creation process. It helps organizations gain insights into how customers engage with their offerings, what their needs and pain points are at different stages, and how to create and deliver value effectively.

A brief video-based walkthrough on how the customer journey is used can be found here: <https://youtu.be/fjTs-SsL5Fc>

Why and when should you use the customer journey?

To understand customer needs: The customer journey helps in gaining insights into customer needs, pain points, and preferences at each stage of their interaction with the product or service. Understanding these aspects can guide product development and marketing efforts to address the specific requirements of the target audience.

To enhance customer experience: mapping out the customer journey helps to identify areas where the customer experience can be improved. This could involve for example providing better support during product usage or enhancing post-purchase interactions. A positive customer experience often leads to increased customer loyalty.

To identify bottlenecks and drop-off points: by analyzing the customer journey, one can pinpoint areas where customers are dropping off or face difficulties. Addressing these issues can lead to increased sales.

To align with stakeholders: understanding the customer journey helps align different stakeholders that have their role in delivering a consistent customer journey.

During product development: the customer journey can inform the development process, ensuring the product or service is designed with the customer's needs and preferences in mind.

During marketing campaigns: the customer journey helps tailor marketing messages and strategies to effectively engage customers at different stages of their decision-making process.

When addressing feedback: analyzing the customer journey can help address specific pain points and issues raised by customers, leading to improvements in the overall customer experience.

How is the customer journey used in practice?

The customer journey of the Dutch innovation initiative (Text Box 4) to support carbon sequestration is illustrated in Figure 16. Their customer journey centers around the farmer as the customer and begins with planning crop rotation and culminates in selling climate-neutral products. The journey can be divided into several stages, each involving various stakeholders and activities. At the outset, the farmer's current crop farming practices, performed without the Dutch carbon sequestration innovation initiative's solution, are mapped using yellow post-its. These represent the activities already in place. Once the carbon sequestration service is implemented, marked by pink post-its, new and adjusted activities come into play. These activities focus on preparing for and implementing

measures to enhance carbon sequestration in the soil. ZLTO soil advisors and bio product suppliers provide valuable advice on sustainable practices. As the crops progress through the reproducing and growing stages, CO₂ is stored in the soil. To optimize this process, the farmer must use compost efficiently and generate machine data. Farmhack is involved in generating this machine data, contributing to making the soil more sustainable. After harvesting the crops, the soil is prepared for the next season. The generated machine data, including information collected from satellites, is read out and measured for sustainability and CO₂ impact. Farmhack plays a crucial role in this data collection. The data is then sent to the NMI database, which calculates the soil performance and provides advice for the next year's crop farming. A reliable certifier system is required to verify the impact of the sustainable practices. This ensures the validity and credibility of the carbon credits generated from the CO₂ stored in the soil. The value of the CO₂ stored is translated into carbon credits, which can be sold in the market. UDEA, a wholesaler, purchases the climate-neutral products from the farmer. UDEA also contracts to buy the carbon credits, enabling them to communicate CO₂-neutral value propositions regarding their products. By participating in the carbon sequestration service and selling climate-neutral products and carbon credits, the farmer gains added financial value. This emphasizes the positive environmental impact of the farmer's produce and contributes to the farmer's overall sustainability goals.

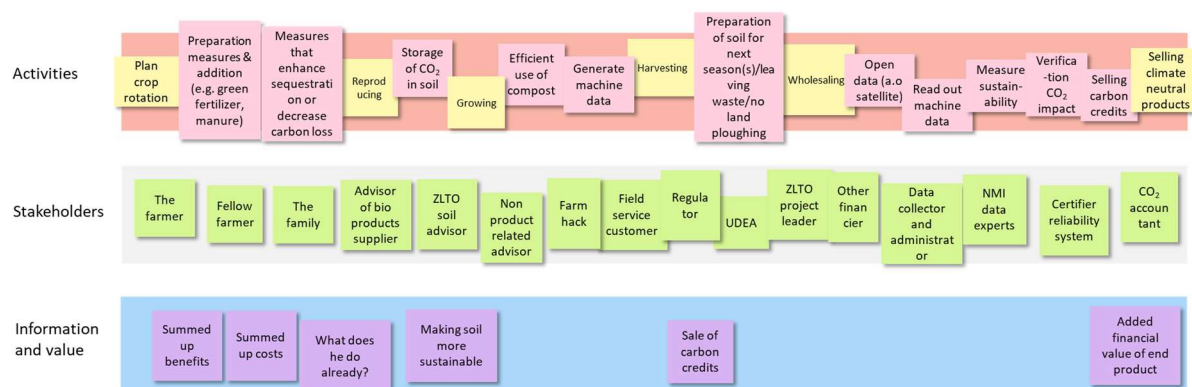


Figure 16 – A filled in customer journey explaining how the carbon sequestration will be used in practice for the Dutch innovation initiative

What recommendations and tips can be given for using the customer journey?

The customer journey can be summarized by means of the training card illustrated in Figure 17, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.

Customer Journey (CJ)

What	Tool to analyze the value creation process or ‘journey’ the customer / end-user takes when using the proposed solution. It represents a template to delineate the steps that are introduced for customers to use the solution. It also captures how these steps are supported through stakeholders and what the process implies in terms of where value is created (or destroyed).
When to use	• Goal: The customer journey supports users in mapping the value creation process of end-users / customers when using the proposed solution. It generates an overview of the steps taken in this process and explains how this 1) contributes to value creation 2) how stakeholders support the steps taken. These insights can drive decision making on the configuration of the solution. • Stage(s): The customer journey succeeds the VPS and is also typically used early on for the SCBMIP to understand how the solution will be used in practice • Type: Co-creation workshop (either online or offline) • Time effort: 1 hour preparation, 1-2 hour workshop (30 minute fill-in per customer segment), 1-2 hour of recording
How to use	• Appoint a facilitator for filling in the customer journey and driving the discussion (typically the SIP leader or orchestrator) • [Facilitator] Prepare a Miro board or similar online collaboration tool that visualizes the customer journey template or use a printed version of the template including post-its and pens. Here, it is important to already determine the scope of the ‘journey’: what is supported / influenced by the new solution and what is not? Take this as a rule of thumb for pre-filling the as-is process to be considered (top row of the template). • [Facilitator] Invite stakeholders relevant to the working or development of the solution to join in for the workshop (e.g. stakeholders that can influence what the solution will look like and how it will work). • [Facilitator] Engage all stakeholders present – make sure that a participative and safe climate is achieved (and that there are no bad ideas) • [Facilitator] Explain the customer journey template; if needed go through an illustrative and easy example. • [All] Discuss the solution and associated customer segment and ensure that consensus is achieved on <i>what</i> the solution is and <i>how</i> it works. If multiple customer segments (see VPS) are considered, this step is taken multiple times. • [All] Jointly go through the steps taken by the customer / end-user to use the solution. Map any <i>new</i> or <i>modified</i> steps (as opposed to the as-is process) taken as a result of the solution (colour-code these). Indicate what stakeholders support these steps (middle row of template). Continue this task until the entire process relevant for the solution is gone through. • [All] Based on the new or modified steps, judge or determine what impact this may have for the value created by the customer end-user: does it add value? – if so, in what way?; Alternatively, does it destroy value? – if so in what way? map this in the bottom row of the template. • [Facilitator] Once the customer journey is completed, conclude on whether in general value is <i>created</i> or <i>destroyed</i> for the customer. Discuss this with the stakeholders present until consensus is achieved.
Strengths	• The customer journey challenges users to place themselves in the perspective of the customer / end-user: what do I need to do to use this solution? What steps are introduced for me? Does the potential burden created outweigh the potential value it can bring? Through the structure approach posed by the customer journey, users of the tool are required to evaluate for each step what this implies for the customer. • The customer journey can be used in a collaborative setting: it serves as the talking point for understanding what the solution should look like and how it works. Sometimes, this knowledge remains tacit if not explicitly discussed, which can lead to potential problems for development later on. • The customer journey can give insights on the potential of adoption of a solution: if limited value is created, this can give a sense of whether users will be interested in using it (more so in case a fee is paid to use the solution).
Weaknesses	• Scoping the customer journey can be difficult: often, users may attribute secondary effects as part of the value creation process or consider effects too broadly (‘the solution intends to contribute to attracting young people in agriculture’). Focus on the primary effects for a <i>single</i> user of the solution to generate insights on whether it in general can be deemed valuable. • Focusing the customer journey can be difficult: particularly in case of technology-heavy solution, discussions can go into very detailed specifics of the solution / how the customer interacts with a software platform. As a result, this becomes very distant from actual value creation steps or activities introduced. As a rule of thumb, aim for at most 10 steps introduced as a result of the solution for mapping the customer journey: this enables a clear overview and starting point for discussion.
Tips	• Aim to have (a representative of) the customer or end-user at the table: assumptions regarding value created / value destroyed can immediately be verified to help in mapping the customer journey. • To avoid too abstract discussions, it is often great to illustrate (if available) the working of the solution: if prototypes or sketches are available, these can significantly help in clarifying the steps taken for the customer journey. Similarly, creating a user story or scenario can help in making things more concrete.

Figure 17 – Training card for the customer journey

3.2.3 DAMIAN: How can I understand the technological and organizational interdependencies related to my innovation?

The **DAMIAN** tool is a versatile framework designed to facilitate the entire process of data utilization within a service or product-based solution. It consists of eight categories, carefully guiding stakeholders through a systematic approach from left to right. The journey begins with "Data Generation," where stakeholders identify the types of data required for analysis and decision-making. This encompasses collecting relevant data from various sources and generating new data points when necessary. Next, in the "Data Generation Methods and Technologies" category, stakeholders outline the methods and technologies employed to acquire and generate the identified data. This may involve utilizing sensors, actuators, or other data-gathering tools. Subsequently, attention is directed towards "Data Access and Storage." Stakeholders define the appropriate databases or servers necessary to store the generated data, ensuring easy accessibility for the intended users. Once the data is in place, the "Data Analysis" stage comes into play. Stakeholders specify the specific data sets used for analysis and identify relevant algorithms and techniques applied to transform and derive meaningful insights. Within the "Data Transformation Techniques" category, stakeholders detail the techniques employed to process raw data into valuable insights. This may involve statistical analysis, machine learning algorithms, or other analytical methods. After insights are generated, the focus shifts to "Insights Access and Distribution." Stakeholders determine the channels through which users can access these valuable insights, which may include websites, applications, or other platforms. Accompanying this, stakeholders also consider "Insights Delivery Mechanisms." This involves designing user-friendly interfaces and effective distribution channels to ensure seamless communication of the obtained insights. Finally, the last column of the DAMIAN tool is dedicated to "End-User Utilization." Stakeholders identify the recipients or users of the generated insights or transformed data, including individuals or entities who will make informed decisions based on the provided information. Throughout the process, stakeholders can indicate the connectivity between different steps, representing the flow of data and information. This may involve specifying whether data processing occurs manually or automatically, ensuring a well-connected and efficient system.

A brief video-based walkthrough on how DAMIAN is used can be found here:

<https://www.youtube.com/watch?v=fjTs-SsL5Fc>

Why and when should you use DAMIAN?

DAMIAN helps to clarify and explicate what a data service in a general sense entails and how it is provided to the customer. The tool sheds light on what and how data is collected and how this data is analysed or transformed. It also indicates who is responsible for doing so. An essential aspect of DAMIAN is its alignment with the customer journey. It comes into play after understanding the customer's needs and expectations, reflecting how technical architecture and data operations support each step of the customer journey. This ensures that the steps taken for the customer journey are seamlessly integrated into the technical solution. By leveraging DAMIAN, organizations gain valuable insights into their data services, identifying potential gaps or inefficiencies in the data flow. This empowers them to optimize data processes, enhance decision-making, and improve the overall customer experience.

How is DAMIAN used in practice?

The DAMIAN tool plays a pivotal role in structuring and understanding the data flow within the Dutch carbon sequestration innovation initiative (see Text Box 4), as illustrated in Figure 18. Below, we outline how each phase of DAMIAN was applied to the Dutch initiative.

In the initial phase, explicit data generation was a priority for the Dutch carbon sequestration innovation initiative. The focus was on collecting data related to the general characteristics of farmland and soil conditions. These essential data points were crucial in understanding the carbon richness of the soil. Additionally, data was collected on the various farming operations executed by farmers. These data points enabled the service to provide valuable advice on improving farming practices for enhanced sustainability. The data collection methods differed for each type of data. Soil data was obtained either through manual measurements or by accessing registers available at local governments. In contrast, data on farming operations was collected using smart sensors deployed at the farms. The collected data points were then stored in a database managed by the service provider.

Once the data was collected, the data analysis phase began. In the case of the Dutch innovation initiative, raw data points were transformed into inputs suitable for the mathematical model supporting the service. The model effectively calculated the sustainability performance of each farmer and recommended specific actions to improve farming operations for sustainability. Additionally, the net effect of carbon farming was calculated, which played a crucial role in determining the carbon credits earned by each farmer.

The final phase focused on data application and the distribution of insights to end-users. For the Dutch initiative, the insights on sustainable farming practices were communicated through an online interface provided by the service provider. Additionally, a dedicated carbon credit platform was made available for accessing these valuable insights. Both the web portal and a user-friendly mobile application served as accessible channels for farmers, government bodies, and retailers to assess and utilize the data.

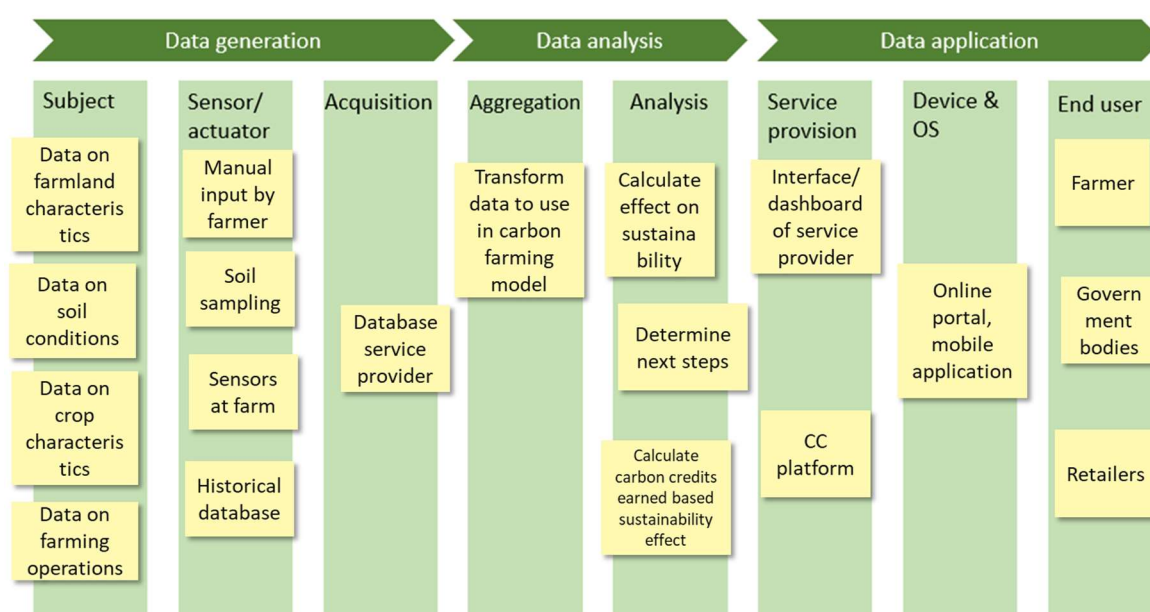


Figure 18 – A filled in DAMIAN template supporting the Dutch carbon sequestration innovation initiative

What recommendations and tips can be given for using DAMIAN?

DAMIAN can be summarized by means of the training card illustrated in Figure 19, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.



DAMIAN

What	Tool to investigate the technical background of the solution and to understand how data is collected and used to create value. It represent a canvas-like template that captures how data is collected, stored, transformed and used (as part of services or platforms) to create value.
When to use	• Goal: The DAMIAN tool is used to map how data is used to create value for end-users / customers. It sheds light on what and how data is collected and how this data is analyzed or transformed. It also indicates who is responsible for doing so. • Stage(s): The DAMIAN tool typically succeeds the customer journey, reflecting how the steps taken for the customer journey are supported through the technical architecture of the solution. • Type: Co-creation workshop (either online or offline) • Time effort: 1 hour preparation, 1 hour workshop, 1 hour of recording
How to use	• Appoint a facilitator for filling in the DAMIAN tool and driving the discussion (typically the SIP leader or orchestrator) • [Facilitator] Prepare a Miro board or similar online collaboration tool that visualizes the DAMIAN template or use a printed version of the template including post-its and pens. • [Facilitator] Invite stakeholders relevant to the working or development of the solution to join in for the workshop (e.g. stakeholders that can influence what the solution will look like and how it will work). Given the technical nature of this task, it is advised that technology stakeholders are definitely involved, but that this can adequately be coupled to business / customer value. • [Facilitator] Engage all stakeholders present – make sure that a participative and safe climate is achieved • [Facilitator] Explain the DAMIAN template; if needed go through an illustrative and easy example. • [All] Discuss the solution and ensure that consensus is achieved on <i>what</i> the solution is and <i>how</i> it works. • [All] Working from left to right on the template, map what data is collected as part of the solution and by whom this is collected. Also indicate where this data is stored (column 1,2 and 3). Challenge this data collection activity: what does it imply for the customer in terms of effort and data privacy? Why are certain data points collected, what value will they add? Does this have implications for the design of the solution (do we need to consider changes)? Alter any data points if needed until consensus is achieved. • [All] At the centre of the template, determine how the data is used: is it transformed or analyzed? Are models or mechanisms in place to do so? Why is this the case, what value is created as a result of this (and to whom)? Who is responsible for this activity? Continue until consensus is achieved. • [All] Focusing on the right of the template, determine how the (transformed) data is accessed and by whom. Are there more users of the data as opposed to the customer? Why is this the case? How does this contribute to value for the customer? • [Facilitator] Once the mapping is complete, verify that the logic / flow of data is correct and summarize the findings to the stakeholders. Adjust issues for which the data flow is not logical (e.g. data is left unused).
Strengths	• The DAMIAN couples ideation to realization: It forces users to become concrete on how the value defined for the customer journey / VPS is to be realized and whether this can actually be facilitated. It also encourages users to think about why data points are collected, particularly if these are not used later to support value creation. In such cases, this data might not have to be collected. • The DAMIAN tool is structured in nature, describing a pathway from data collection towards data use. This logic has to be consistent and correct (data cannot disappear and models can not operate without data). By tracking the flow of data, users can support the mapping process.
Weaknesses	• Despite its value orientation, DAMIAN remains a tool to investigate the technical architecture of solutions. If a solution is not (overly) technical, limited insights will be generated through the application of DAMIAN. • Data points can follow different trajectories: if a solution is very data heavy, this may result in multiple intertwined trajectories of how data is used and where data is stored. Using the template, this can potentially make the analysis quite complex and make it (visually) difficult to interpret. A good practice here is to consider grouping data points that more or less describe similar objects (for example grouping all data points that relate to 'soil management'). • The use of DAMIAN calls for at least some knowledge on what the technical architecture of a solution will look like. While it can be used as an exploratory tool (how do we want to shape our solution?), it works better to investigate an already ideated technical architecture.
Tips	• Aim to have (a representative of) the customer or end-user at the table: assumptions regarding value created / value destroyed can immediately be verified to help in making decisions on the technical architecture of the solution. • To avoid too abstract discussions, it is often great to illustrate (if available) the working of the solution: if prototypes or sketches are available, these can significantly help in clarifying how data is collected (and what this implies) or how (transformed) data can be accessed and where. Similarly, creating a user story or scenario can help in making things more concrete.

Figure 19 – DAMIAN training card

3.2.4 Service-Dominant Business Model Radar: How can I model collaborative value creation and capture?

The **Service-Dominant Business Model Radar (SDBM/R)** is a tool used to support the design of (service-driven) business models (Turetken et al., 2019). It is based on the premises of service-dominant logic, which considers value creation for customers or end-users through (often digitally-enabled) service-based solutions. In contrast to the popularized Business Model Canvas (BMC) (Osterwalder & Pigneur, 2010), it adopts an explicit networked or collaborative perspective on business modelling, meaning that the business logic central to a business model design is always the result of the collaboration between partners in a business network.

Why and when should you use the service-dominant business model radar?

The SDBM/R is a valuable tool that should be used in specific scenarios where collaborative business models are being designed, especially in the context of sustainability innovation or service solutions. Here are some reasons why and when you should use the SDBM/R:

Designing Collaborative Business Models: The SDBM/R is particularly useful when you are looking to design business models that involve multiple partners working collaboratively. It helps you identify the value-in-use created through the service solution and how each partner's individual value propositions contribute to the overall success of the business network.

Enhancing Value Creation for Customers: When you want to create a deeper understanding of how your service or innovation generates value for customers, the SDBM/R provides a structured framework to reflect on the value created through the service and tailor it to meet customer needs effectively.

Identifying and Mitigating Business Risks: By using the SDBM/R, you can proactively identify potential business risks associated with the innovation or service. It helps you assess whether the customer segment would be interested in the solution considering their costs and benefits and whether partners can make the necessary investments to support the implementation or rollout of the solution. This early identification enables you to mitigate risks and challenges.

Optimizing Commercialization: When you need to develop a clear and explicit commercialization plan for your new service or innovation, the SDBM/R helps you think through the business model design and identify models that align with your objectives and goals.

Communicating Business Model Strategy: The SDBM/R provides a structured way to communicate how your service solution or innovation will be rolled out and how it involves various stakeholders. This clear communication fosters better understanding and collaboration among partners.

The tool is most effective when you have a clear understanding of the service solution's usage and its expected value, as well as an awareness of the partners needed to support the rollout.

How is the service-dominant business model radar used in practice?

In Figure 20, we present the SDBM/R of a Slovenian drone-based smart soil and fertilization management innovation initiative (further explained in Text box 5), with their co-created value proposition placed at the center: "Sustainable and financially beneficial, digital farming practices." This proposition reflects the core essence of the Slovenian innovation initiative's offering, which revolves around a precision farming solution which leverages data collected at medium to large-scale farmers to provide data-driven advice on how farmers can improve their farming operations sustainably. To

realize this proposition, the collaboration of several actors is essential, as the co-created value involves various aspects that require unique contributions.

Text Box 5 – Precision farming to support soil health and sustainable farming for large scale farmers in Slovenia

The Slovenian drone-based smart soil and fertilization management innovation initiative is based in Slovenia, and addresses typically large-scale farmers willing to optimize their farming operations. Logically, managing large-scale farms poses challenges in terms of consistent and efficient farming, as conditions across farmlands may change or may consider different produce to be cultivated. This can make it difficult for farmers to sustain a consistent and reliable quality for their produce, ultimately affecting the degree to which they can maintain their survivability and productivity in modern markets. More so, like agri-firms in many countries, farmers in Slovenia are also mandated to make their farming practices increasingly more sustainable to reduce emissions and to contribute towards improving the environment.

To support farmers in overcoming these challenges, the Slovenian innovation initiative focuses on the development and roll-out of precision farming solutions to support the optimal preparation and applications of fertilizers plans. In general, the solution for optimal preparation of fertilization plans, combines different types of technologies and data sources:

- (a) Satellite imagery and drones is used for constant monitoring of crops for detecting anomalies in crops. Accordingly, large areas (particularly the case for large scale farmers) can be analysed consistently.
- (b) Data is collected on the crop performance to provide advice on fertilization and pesticide use as well as the use of water. Both through inputs by the farmer, but also through sensors, such information can be collected and analyzed.
- (c) Target soil sampling is applied to understand and monitor the quality of the soil at different locations for the farmer, such that advice given can be geared towards maintaining the quality of the soil. By doing so, over (or under)use of fertilizer can be avoided.
- (d) All information is analyzed by agronomists by KGZS (an agricultural service provider in Slovenia) providing guidance and support to farmers to improve their farming practices in a sustainable way. Such sustainable efforts can also be coupled to subsidization reward sustainable practices.

The sources and technologies above are merged as part of a single service offered by KGZS, supported by Termotron (providing drone support as well as the generation of fertilization plans) as well as ITC (providing technical support on building a platform that is easy to use by farmers). Through a subscription fee, farmers can access the service offered and use data-driven insights to support their decision making. The Slovenian drone-based innovation initiative is actively investigating how the sustainable collaborative business model should be configured such that farmers can reliably access and use the service in practice.

In this case, three key actors play crucial roles in bringing the co-created value to life: ITC, KGZS, and Termotron. Each of these actors brings essential expertise and resources to the table. KGZS, responsible for integrating the contributions of the other actors and providing comprehensive advice to the farmer.

The farmer, represented in the green pie chart, is the customer of the co-created value, and accesses the service offered by KGZS. It will interact with KGZS to facilitate data collection and to work with KGZS on how to proceed to make its farming operations more sustainable (whilst preserving, or even improving on the quality of its produce). The farmer therefore benefits from the sustainable and financially beneficial digital farming practices (in return for a subscription fee paid to KGZS).

KGZS is the orchestrator for the business model design, providing advice to the farmer based on data collected. It also works on establishing communities of farmers such that farmers can also share their learnings with others. To provide such a service, KGZS actively works on connecting and integration technological solutions offered by ITC and Termotron as part of a single service proposition.

In this orchestrating role, it ensures that ITC maintains the platform that farmers use to access the service, input data, and receive advice. ITC therefore has a clear value proposition in terms of maintaining and developing the platform. To support communities of farmers, it also focuses on connectivity between farmers (such that learnings can be shared). For doing so, it receives part of the

subscription fee collected by KGZS from large-scale farmers. Additionally, ITC benefits from knowledge development and gains a sustainable image, reinforcing its position as a leader in the domain of sustainable farming practices. However, operational costs are incurred to support the maintenance and development of the platform, such that additional users over time can be supported.

Termodron on the other hand contributes towards the collection of data on the field. It employs sensors and drones to monitor the soil quality of farmers, identifying differences in soil characteristics as well as areas for fertilization. This data is transformed into fertilization plans by Termodron which are communicated to KGZS to build their advice on. Again, for providing this service, KGZS pays part of the subscription fee captured to Termodron. Logically, Termodron takes (long-term) care of maintaining the drones and sensors such that use of the service (precision farming) can be sustained.

In conclusion, the SDBM/R example of the Slovenian drone-based innovation initiative demonstrates how designing sustainable collaborative business models can help to concretize how the value proposition of sustainable and financially beneficial digital farming practices can be delivered in practice. The orchestration by KGZS, along with the unique contributions of ITC, Termodron, and other actors, showcases the importance of collaboration in generating holistic and impactful value for the farmer, as well as for each participating actor. The SDBM/R provides a clear representation of the value co-creation dynamics within this ecosystem, emphasizing the essential roles each actor plays in the successful implementation of the Slovenian initiative's proposition.

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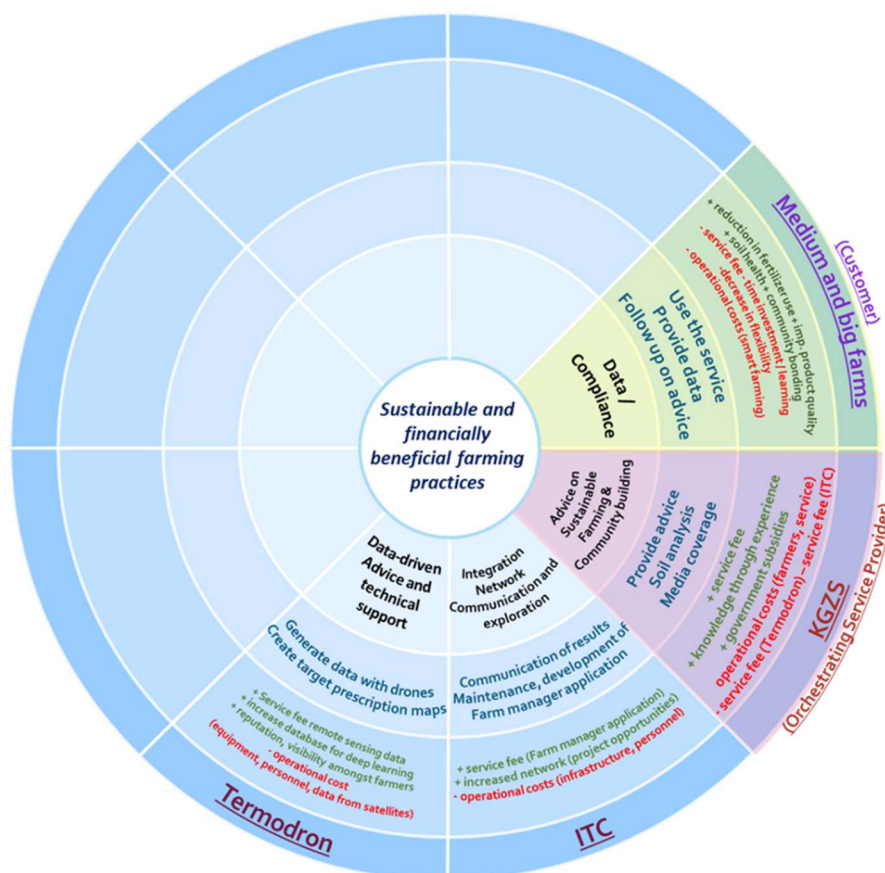


Figure 20 – Business model design geared towards achieving sustainable and financially beneficial farming practices in the Slovenian innovation initiative

What recommendations and tips can be given for using the service-dominant business model radar

The SDBM/R can be summarized by means of the training card illustrated in Figure 21, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.



Service-Dominant Business Model Radar (SDBM/R)

What	Tool to outline and delineate the different actors in a business model, the joint value that is created, activities and resources performed and benefits and costs associated. It is based on the premises of service-dominant logic, which considers value creation for customers or end-users through (often digitally-enabled) service-based solutions.
When to use	• Goal: The SDBM/R supports users in designing and ideating collaborative business models that fit their sustainability innovation or service solution. • Stage(s): during the design of (service-driven) business models • Type: Co-creation workshop (either online or offline) • Time effort: 1 hour preparation, 2 hours workshop, 1 hour recording
How to use	• Appoint a facilitator Prepare a Miro board (or similar) of the radar (online) or a printed version (offline), including post-its and pens. • [Facilitator] All actors in the BMR should be present at the workshop • [Facilitator] Make sure all participants are engaged, can see all ideas and are able to contribute • [Facilitator] Explain the BMR, ask everyone to actively contribute and stress that there are no bad ideas • [All] Start with the center of the model (co-created value-in-use), focussing on what value is created. Make sure all actors agree. • [All] Next, the orchestrator for the business model design should be selected. Generally, the orchestrator is a party that has a central or pivotal role for the business network (for example in terms of orchestrating activities or collecting and integrating data) • [All] After the orchestrator has been selected, the remainder of the business network should be defined, starting with the customer / end-user • [All] To understand whether the business network is complete and correct, the value propositions of each actor should be considered. As a rule of thumb, the set of value propositions of each actor involved for the business model design should 'complete' or enable the co-created value-in-use to be created • [All] Once the actors included and value propositions are defined, the activities and resources can be mapped. On the basis of this, the costs and benefits captured per actor can be detailed, paying attention to how (financial) value is exchanged for the business model design (i.e., who pays who for what services). • [All] This is an iterative process, changes can be made throughout the workshop
Strengths	• The tool addresses all aspects of business model design and is easy to use in workshop formats (through post-its). • It adopts an explicit networked or collaborative perspective on business modelling, meaning that the business logic central to a business model design is always the result of the collaboration between partners in a business network. • You can discuss and challenge the views different actors have and collaboratively come to a joint understanding • By constructing a joint view, you increase support for the solution because everybody contributed • By using the BMR implicit assumption about your network partners will be made explicit and can be tested
Weaknesses	• All partners must feel at liberty to express their views. • In a group setting it could be complicated for some to speak out potentially negative feedback to network partners • Less informed partners might not be familiar with defining a co-created value-in-use or don't have a clear view of the value proposition • It can be difficult to distinguish what stakeholders should be included as part of the business network and what stakeholders can be considered bilaterally / through outsourcing relationships (outside of the BM). As a rule of thumb, the value proposition offered by each stakeholder is leading. You should consider to what extent this value proposition fits or is essential to the co-creation value-in-use or whether this is stakeholder provides a common service (e.g. regular transport versus specialized transport that helps to create value).
Tips	• It can sometimes be valuable to skip parts of the SDBM/R template to help ideation: for example, rather than focusing on the costs and benefits (which can often result in a rather detailed discussion on whether this is appropriate or viable), you may only focus on how the solution is to be established (and temporarily ignore associated costs). This can help in better clarifying how stakeholders should collaborate to deliver solutions to customers, and what activities as a result should be undertaken. • Colour coding of the exchange of costs and benefits can help in making explicit how (financial) value is exchanged amongst business stakeholders (it becomes more explicit 'who pays who'). This can help in supporting the discussion on what prices should be set for services or products exchanged as part of the business model design.

Figure 21 – Training card for the Service-Dominant Business Model Radar

3.2.5 Benefits Realization Mapping: How can I understand how my innovation leads to change and establish sustainable and substantial impact?

Benefits Realization Mapping is a powerful tool used to articulate and structure the logical path from project deliverables to the achievement of (long-term) impact. It offers a sequenced perspective on how these deliverables empower end-users or customers to adopt new approaches, which, in turn, can lead to transformative changes in their current business activities and practices. The tool explores how these changes can create value for customers and end-users, while also recognizing that value can be gained or lost during this process. Depending on the scope considered, this value creation can contribute to achieving impact at various scales.

The primary goal of Benefits Realization Mapping is to bring clarity and transparency to the expected outcomes of a new solution or innovation. By detailing each element of the mapping process, stakeholders are compelled to explicitly articulate how they envision achieving impact through the implementation of the proposed solution or innovation.

In essence, Benefits Realization Mapping provides a strategic roadmap, helping stakeholders identify potential challenges, risks, and opportunities. By mapping out the logical connections between deliverables, end-user actions, value creation, and the broader impact, stakeholders can better understand the sequence of events and dependencies required to achieve the desired outcomes. This fosters effective decision-making and resource allocation throughout the project lifecycle.

Why and when should you use benefits realization mapping?

Strategic Planning: Benefits Realization Mapping helps organizations in strategic planning by providing a structured approach to articulate the logical path from project deliverables to desired impacts. It ensures that objectives are aligned with the broader organizational goals and helps in prioritizing initiatives.

Decision-Making: Benefits Realization Mapping provides a clear framework for decision-making, as it highlights the cause-and-effect relationships between project deliverables, actions by end-users, value creation, and ultimate impact. This clarity empowers stakeholders to make informed decisions.

Monitoring and Evaluation: Benefits Realization Mapping allows organizations to establish key performance indicators (KPIs) and milestones to track progress towards achieving the intended outcomes. It facilitates effective monitoring and evaluation of the project's success.

Aligning Stakeholders: When multiple stakeholders are involved in a project, Benefits Realization Mapping fosters a shared understanding of responsibilities and roles in achieving the desired impact. It encourages accountability and collaboration among stakeholders.

Benefits Realization Mapping should be used throughout the project lifecycle, from project initiation to post-implementation review. It is a versatile tool that supports strategic planning, resource allocation, decision-making, risk assessment, performance improvement, and effective communication of value propositions.

How is benefits realization mapping used in practice?

In Figure 22, we present the benefits realization mapping of the Slovenian drone-based innovation initiative (Text Box 5), focusing on their deliverable, which is a smart precision farming service. By harnessing advanced technologies, including satellite data and input from farmers, this service

generates valuable data on soil and plant conditions. This data serves as the foundation for driving impactful changes in farming practices. The success of the smart precision farming service relies on the integration of various inputs and enablers. The primary inputs are satellite data, providing real-time and comprehensive information on soil conditions, and farmer inputs, which enrich the data with on-the-ground knowledge. The seamless integration of these inputs enables the service to deliver accurate and actionable recommendations to farmers. Additionally, the technological enablers, such as advanced data analysis algorithms, visualization tools, and user-friendly interfaces, play a pivotal role in making the service accessible and user-friendly for farmers of all backgrounds. To maximize the benefits of the smart precision farming service, the Slovenian initiative recognizes the significance of business and behavioral changes. Farmers need to embrace data-driven decision-making, actively incorporating the service's insights and recommendations into their daily farming practices. This transformative shift in behavior fosters more sustainable agricultural practices and resource optimization. From a business perspective, the implementation of the service may require organizational adjustments in farming operations and data management protocols. Farmers need to adapt their practices to integrate the service seamlessly and leverage its full potential. The pilot outcomes of the smart precision farming service are both promising and impactful. As farmers begin to adopt the service's recommendations, an immediate reduction in fertilizer usage is observed. This environmentally friendly approach leads to improved soil quality and fosters sustainable farming practices. Moreover, the service generates valuable insights from diverse farming experiences. These findings lay the foundation for the Slovenian drone-based innovation initiative to expand the service, engaging more farmers in the journey towards collaborative and community-driven precision farming practices. As the smart precision farming service gains momentum, its scale outcomes become more significant. Beyond individual farmers, the service creates a connected network of stakeholders, fostering collaboration and knowledge exchange. This growing community of farmers and service providers collectively contributes to sustainable agriculture and resource optimization. The data-driven approach facilitated by the service results in improved prediction models for precision farming. As more farmers participate, the collective data enhances the service's ability to provide precise and customized recommendations, contributing to increased productivity and minimized environmental impact. The long-term impact of the Slovenian initiative's smart precision farming service is multifaceted and far-reaching. By supporting small and large-scale farmers in reducing fertilizer usage, the service champions sustainable farming practices, benefiting the environment and agriculture sector as a whole. The continuous generation of insights and knowledge further elevates the precision farming prediction and analysis models. Over time, these models become increasingly sophisticated, empowering farmers with precise and data-driven decision-making capabilities. Lastly, the service fosters lasting connections among farmers and service providers. This collaborative network amplifies efforts towards sustainable agriculture and resource optimization, contributing to a more resilient and thriving farming community.

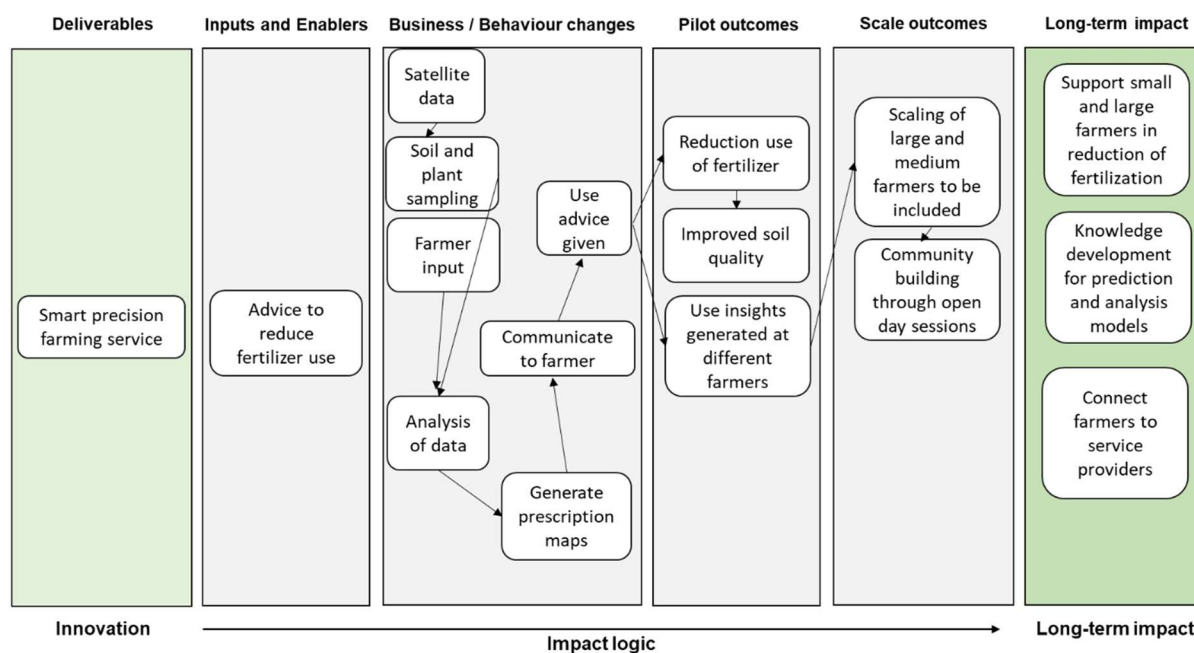


Figure 22 – Benefits Realization Mapping supporting the impact logic for the Slovenian innovation initiative

What recommendations and tips can be given for using benefits realization mapping?

Benefits Realization Mapping can be summarized by means of the training card illustrated in Figure 23, offering a quick point of reference on how the tool is used, as well as helpful insights on its strengths, weaknesses and tips of use.

Benefits Realization Mapping (BRM)

What	Tool to analyze the implementation and realization of the business model over time and to investigate the pathway towards impact and its underlying assumptions and challenges. It represents a process-like template describing the spectrum from solution towards long-term impact.
When to use	Goal: BRM is used to analyze what activities through time each stakeholder needs to make to realize the proposed BM / solution and to identify assumptions and challenges related to these activities. It also couples BM realization to achieving long-term impact: what is needed <i>at what scale</i> to do so? Stage(s): BRM typically concludes the SCMIIP and succeeds the use of the SDBM/R. Type: Co-evaluation workshop (either online or offline) Time effort: 2 hour preparation, 2 hour workshop (depending on the size of the stakeholder group), 2 hour of recording
How to use	- Appoint a facilitator for filling in the BRM and driving the discussion (typically the SIP leader or orchestrator) [Facilitator] Prepare a Miro board or similar online collaboration tool that visualizes the BRM or use a printed version of the template including post-its and pens. [Facilitator] Invite stakeholders relevant to the working or development of the solution to join in for the workshop (e.g. stakeholders that can influence what the solution will look like and how it will work). [Facilitator] Engage all stakeholders present – make sure that a participative and safe climate is achieved [Facilitator] Explain the BRM template; if needed go through an illustrative and easy example. [All] map the solution and deliverables for the ‘deliverables’ column and describe what this solution enables (and for whom). Also indicate what stakeholder is responsible for <i>providing / enabling</i> the solution. Continue this task until all enablers are defined. Note that a solution can consist of multiple deliverables with different enablers. Then, map what long-term impact is to be achieved per stakeholder in the ‘long-term impact’ column. The goal is to clarify the pathway between the columns. [All] For the ‘business changes’ column, map the steps that should be taken to achieve impact on a pilot level. Generally, this follows the process of the end-user using the solution. Next, <i>challenge</i> each step: What assumptions underlie the step? Can the step be realized and are the assumptions realistic? What potential barriers can be identified? Continue this task until all steps have been assessed. This should result in a longlist of assumptions / challenges open and a ‘pathway towards impact’. [All] For the ‘pilot impact’ column, indicate how the pathway towards impact creates (or destroys) value for stakeholders involved. Discuss whether this value is appropriate for all stakeholders involved and what the <i>discrepancy / delta</i> is in regards to long-term impact. What does this imply for the scaling intentions? [All] For the ‘scaling’ column, discuss jointly what scaling strategies will be pursued (also see the tips for BRM). The selected scaling strategies should contribute to achieving long-term impact. For the (set of) strategies selected, determine what steps should be taken by what stakeholders to facilitate this. Again, <i>challenge</i> these steps to identify assumptions / barriers. [Facilitator] Once the BRM is filled in, the pathway towards impact should be verified and checked. Jointly discuss whether the pathway makes sense, and how potential barriers can be addressed. Make any changes to the BM if needed to do so.
Strengths	- The BRM includes a explicit time dimension / process-orientation, and provides a holistic perspective on how the stakeholder consortium will realize the collaborative business model / implement the solution as well as how this is linked to long-term impact. It therefore brings together solution, BM and long-term impact for stakeholders to reflect on, putting the pieces together. - The BRM enables users to become concrete about BM implementation: it enables stakeholders to challenge the assumptions or risks underlying activities towards BM implementation and can help in understanding whether the BM is appropriate. It also sheds light on whether stakeholders are able to scale to achieve long-term objectives.
Weaknesses	- Filling in a BRM is a complex task: it covers the implementation and realization of the BM / solution and may involve talking about different types of challenges and assumptions (technical to business to social). As a consequence, an experienced facilitator is needed to guide the application of this tool. - Depending on how large the stakeholder consortium is, multiple workshop sessions may be needed to cover the perspective of each stakeholder. - The pathway towards impact can become interwoven and interlinked with many concurrent tasks or activities, making it increasingly difficult to interpret or communicate on the BRM. An idea could be to break the BRM in parts or to discuss the BRM per deliverable of the solution (however, both may tarnish the holistic perspective) .
Tips	- As the BRM can go into detail quickly it is a good practice to pre-fill the BRM before the workshop. This helps to manage time effectively for the workshop and to steer discussion and decision making more efficiently. The facilitator can ask stakeholders for their most important challenges still remaining and to already map these challenges for the BRM. This can serve in the workshop as the starting point for discussion. - As potential scaling strategies, one can either focus on <i>market expansion</i> or on <i>extending the value</i> offered by the solution. Within these strategies, one can consider to 1) expand the current customer base, 2) increase market readiness, 3) further develop / fine-tune the product or 4) diversify the product (e.g. cater to different customer segments). Note that multiple scaling strategies can jointly be used. The collaboration should determine what strategies are most appropriate. - Since different activities can be executed by different stakeholders, often jointly, it is a good practice to color-code activities by the stakeholder(s) that is(are) involved in it. This can help in maintaining the interpretability of the BRM. - The BRM should serve as a driver to invest / work towards implementation: It is therefore valuable to focus explicitly on what each stakeholders desires to achieve long-term (final column) to create such commitment.

Figure 23 – Training card for Benefits Realization Mapping

3.3 How can I understand how our data is creating value?

Valorization of data is becoming increasingly important, since more and more companies adopt digital technologies and rely on them to support their business activities for a wide variety of reasons. Opportunities arise to create value through the transformation of data assets, however challenges remain on how to turn extracted data into knowledge that can support effective actions and generate real value. The **Data Valorization Framework** (Figure 24) is developed to help farmers and agricultural supply chains to understand the actual value of data produced by data-driven sustainable collaborative business models and to provide insights on potential further exploitation of available resources.

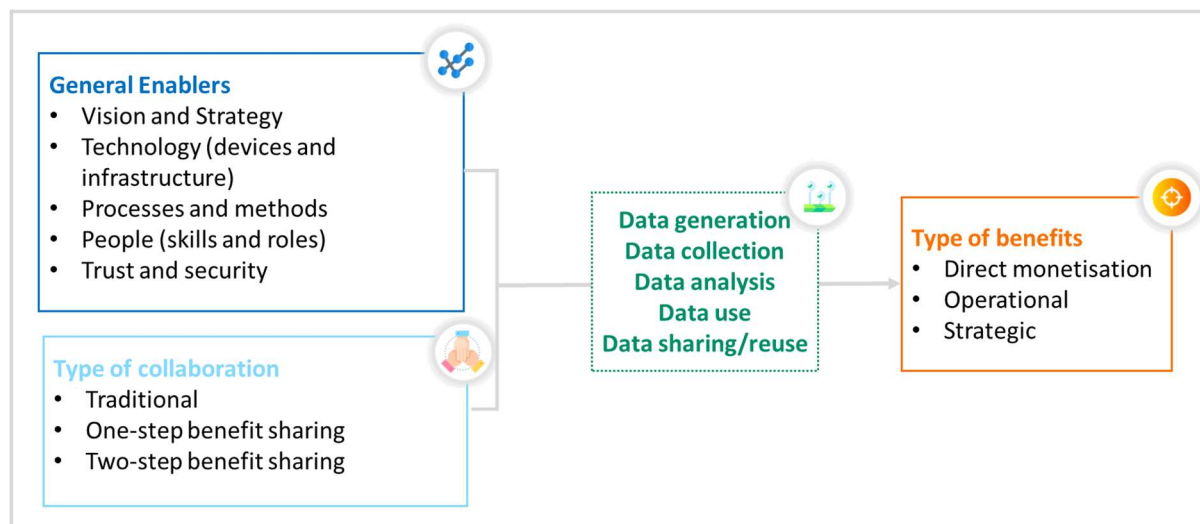


Figure 24 – Data valorization framework

The framework is based on four key variables, namely:

- General enablers;** the elements that allow farmers and supply chain actors to be aware of the data resources they have available, to devise appropriate strategies and to deploy effective tools to exploit the value of data. In particular, five enablers have been included in the framework: *i)* vision and strategy, *ii)* digital technology, *iii)* processes and methods, *iv)* people, *v)* trust and security.
- Collaborative benefits;** the different types of value generated by data throughout the data value chain, which include: traditional benefit; one-step/mutual benefit sharing, two-step benefit sharing.
- Data value chain;** the interrelated processes that allow to extract data's value throughout its entire lifecycle from data generation to data use and exchange.
- Scope of the benefits;** the impact of the benefit on the companies involved in the value chain: direct monetisation, operational or strategic. Additionally, there are several methods to calculate the benefits; *i)* Economic value of information (EVI); *ii)* cost value of information (CVI); *iii)* market value of information (MVI); *iv)* expected value of information (EXPVI).

Why and when should you use data valorization framework?

The data valorisation framework can be used in various ways. First, the framework can be used to identify and enable new business models, by identifying how to use available data. Shared use of data and analytics can be an important revenue source and can play a key role in realizing some (sustainability) objectives. For example, better coordination is facilitated by data or data allows for better decision making. Additionally, the framework can be used more explorative. When there is no

clear idea on which data is available and how to use the data this can be explored in a brainstorm session. The sustainability objective might be used as starting point. Probably, there will be unexploited sources of information and data, in an explorative session new options to use these data might be found. To see the quantified value of these sources, the framework allows participants to go in more depth after identifying promising pathways. In either case, social, environmental and economic benefits can be achieved.

Since, it is a collaborative framework, the use depends on the type of collaboration. When the relationship between the actors is strong and there is a high level of trust, it is possible to have an in-depth discussion on how to exploit additional data opportunities. This might lead to some more complex business models and discussions on a fair way of distributing the value. When collaborations are still quite young it is important to find common ground and shared objectives to see how data can play a role in this and increase collaboration.

How is the data valorization framework used in practice?

We can illustrate how the Data Valorization Framework can be used in practice by using a case on the island of Mallorca in Spain (a Balearic innovation initiative to digitally integrate smart and sustainable farming into hospitality services, further explain in Text Box 6) where agricultural experiences are offered to tourists and thus a collaboration between the agricultural and tourist sector is advanced. Different actors are involved in this case, e.g; farmer's union, technology provider, processing industry, tourism cluster and academic and research representatives. The initial situation is that the land on the island is for 85% used for agricultural activities, however there is also a very lively tourism sector on the island. Through collaboration the involved actors hope to create additional value for both the agricultural and tourist sector. However, setting up such a collaboration might be challenging and thus some guidance of this process is important. The Data Valorisation Framework can be used to structurally identify which options there are to use data to enhance the collaboration and create and capture value for the involved actors. The four key variables are used and the insights are described in the following three tables (i.e. Table 2, Table 3, and Table 4).

Table 2 focuses on the enabling factors that help to exploit data. Table 3 details the benefits that follow from the enabling factors and who the beneficiaries are, in what phase the benefit occurs (benefit type), the data step that is linked to the benefit and lastly what kind of collaboration is related to the benefit. The last table (Table 4) focuses on the quantification of the identified benefits.

Text Box 6 – Establishing sustainable tourism propositions for the Balearic Islands

The Balearic innovation initiative to digitally integrate smart and sustainable farming into hospitality services in Ploutos is based in Mallorca (part of the Balearic Islands) and focuses on local agricultural practices for the island. Here, farmers produce a variety of products such as tomatoes, olives, various fruits and almonds for a variety of markets. Export to mainland of these products however is faced with increased costs as opposed to mainland production, as the products have to be transported off the island before they can reach their final destination. In this context, it is of interest to farmers in Mallorca to produce for local markets and to create a local food experience at restaurants or at local retail outlets. This could potentially also serve as a valuable proposition to tourism: rather than the traditional tourism proposition (beach and bar experience at El Arenal), it would attract tourists interested in experience the agriculture side of Mallorca and to indulge in local products as part of this customer experience. To do so, farmers would need to support to communicate this local and sustainable nature and to connect this to existing tourism propositions or to establish new alternatives.

To this end, the Balearic digital agri-tourism innovation initiative focuses on the development and roll-out of smart farming and traceability solutions that help farmers on the one hand better control their cultivation practices, and on the other hand collect data which can be used to communicate the local and sustainable value of their produce. For the former, data is collected at greenhouses or farming locations on the cultivation process, which is analyzed and on the basis of which advice is given to farmers to improve their farming operations. For the latter, the data collected can be used to provide trust in how products at local restaurants or retail outlets have been produced: consumers can review where products originate from (at what specific farm or even farmland location), what emissions have been avoided or what sustainable action has been taken as part of the cultivation process, and get insights on the nutritional value of the products.

In addition, the Balearic digital agri-tourism innovation initiative is also working together with hotel chains for the island to connect this local and sustainable value to tourism propositions. Hotel chains typically serve as the 'gateway' to the island, creating the interface to tourists interested in visiting the island. Through establishing collaborations with hotel chains, farmers and innovation intermediaries or service providers, the Balearic digital agri-tourism innovation initiative intends to realize agri-tourism propositions, specifically geared towards tourists interested in experiencing agriculture or the countryside as part of their visit to Mallorca. To support these propositions, the data collected through smart farming and traceability solutions can be used. For example, the blossoming of almond trees on Mallorca is typically considered as a unique experience and visit which can be marketed to tourists. Collecting information on the timing of the blossoming (as well as what areas to visit) through smart farming solutions can enable such a proposition in practice. Accordingly, hotel chains can market such an activity to their visitors for a fee, generating value for both the hotel chain and farmers involved. It goes to show that different sources of data can be considered in light of building tourism experiences, and can create value for a multitude of actors involved. To this end, understanding the value of data can help in building and innovating these business models.

Table 2 – Enablers for the Balearic innovation initiative

Enablers	Description
Vision and Strategy	The collaboration between the agricultural and tourist sector, where agricultural lands also become a place to further stimulate economic gains from tourism seems to be a win-win situation. Nevertheless, some challenges must be taken into consideration in order to correctly develop this collaboration, such as the lagging behind of the agricultural sector in terms of adoption of disruptive technologies. The application of IoT solutions aims at making the agricultural sector more competitive and to generate more synergies with the tourism sector.
Technology (hardware, software and infrastructure)	Smart farming platform. The platform supports farmer's intelligent decision making through providing insights in: a) real time access to weather conditions b) weather forecasts on a parcel level c) soil conditions, and d) production predictions. Traceability solutions that enhance sharing information throughout the whole value chain. Smart farming technologies that allow to collect and store information of applied farming practices. Data interoperability – Data management platform. A data management platform that can facilitate a uniform way for collecting, maintaining and providing data. Real-time multi-device monitoring and Benchmarking tools to generate a catalogue which improves the information that can be shared with tourist operators.
Processes and methods	The process is structured following 4 main activities: 1) Deployment and operation of IoT infrastructure for data collection and analysis 2) Design, Development and Deployment of the technological and non-technological solutions that are proposed by the actors. Pilot trials and user testing to develop a data-based Smart Farming advisory system. 3) Dissemination, demonstration and exploitation of the results, to secure further scaling of the solution.
People (skills and roles)	The involved actors include the following organisations: farmer's union, technology provider, processing industry, tourism cluster and academic and research representatives
Trust and Security	It is important to create trust between the involved participants, this is secured through the following actions: • Making farmers understand the importance of sharing data. • Collaborations among actors that have an excellent reputation. • Inclusive attitude towards farmers, by working together to develop certain technologies, such as a personalized dashboard.

Table 3 – Benefits mapping for the Balearic innovation initiative

ID	Benefit description	Beneficiary	Benefit type	Data value chain step	Type of collaboration
1	Savings thanks to the reduction of water consumption (~20%) and pesticide use (~10%) through intelligent decision making with regards to farming practices.	Farmer Agro-food cooperative Processing industry	Operational	Data use	Traditional
2	Reduction of production costs: ~18,6%	Farmers	Operational	Data use	Traditional
3	Increased final product value from enhanced quality and visibility: ≥ 10%	Farmers Travel operators	Strategic	Data use	Two-step benefit sharing
4	Production increase	Farmer; Processing industry	Operational	Data use	Traditional
5	Higher level of economic balance promoted thanks to the diversification of the sectors and the collaboration between tourism and agriculture	Inhabitants; Travel operators	Strategic	Data sharing	One-step benefit sharing
6	Higher incomes thanks to data supported decision making (e.g. for irrigation or use of pesticides) will favour attractiveness of the farmer profession for young generations	Agro-food cooperative Processing industry Inhabitants	Strategic	Data use	Traditional
7	Generation of new tourist services related to the agri-food sector.	Processing industry Travel operators Inhabitants	Strategic	Data sharing	Two-steps benefit sharing
8	Generation of new business models based on the efficient use of data, thanks to synergies between agriculture and tourism.	Farmers; tourism actors	Strategic	Data sharing	One-step benefit sharing
9	Repeatability of the technology solution and methodology for acquiring certificates and labels in any kind of cultivation system that uses IoT.	Farmers Technology provider, Processing industry	Operational	Data sharing	Two steps benefits sharing

Table 4 – Quantification of collaborative benefits for the Balearic innovation initiative

ID	Description	Beneficiary	Valuation method	Benefit value (yearly, per single farmer)	Notes
1	Higher revenue from product sale for Tourism actors selling branded products and receiving a fee and for the farmer due to increased higher quality and visibility of the products and also inclusion of the eCommerce sale channel (€/yr)	Farmers; Tourism Actors	MVI	Increased final product value from enhanced quality and visibility: $232,500,000 \text{ €} \times 0.85$ $= 197,625,000 \text{ €/yr}$ Fee for Tourism operators selling branded products $232,500,000 \text{ €} \times 1.85 \times 0.01$ $= 4,301,250 \text{ €/yr}$ Additional revenues from eCommerce channel $232,500,000 \times 0.03$ $= 6,975,000 \text{ €/yr}$	• <u>Assumption:</u> the target of 80-90% increased value is met • The economic value of agri-food farms in the Balearic Islands was 232.5 million € and they occupied some 225,595 hectares¹ • <u>Assumption:</u> Tourism actor selling the branded product receives a fee of 1% • <u>Assumption:</u> eCommerce generates an increase of 3% in product sale
Total monetary value: 208,901,250 €/yr					Gross of the technology

¹ Source: <https://mallorcaglobalmag.es/en/aumento-consumo-producto-local-proximidad-mallorca/#:~:text=According%20to%20the%20data%20analyzed,they%20occupied%20some%20225%2C595%20hectares.>

ID	Description	Beneficiary	Valuation method	Benefit value (yearly, per single farmer)	Notes
2	Increase of total spend from tourists due to a more accurate marketing proposition exploiting almond blossom attractive capacity (€/yr)	Tourism Actors (Tour Operators, Hotels and other accommodations, ...)	MVI	Average tourists per month (assuming an even distribution through the months): $16,450,000/12 = 1,370,833$ First the increased spend of tourists during the flowering months is computed: $0.01 \times 1,370,833 \times 159\text{€/day} \times 30\text{days}$ $= 65,388,734 \text{ €/yr}^2$	16.45 million arrivals in the Balearic Islands in 2019 (pre-pandemic) (statista) - Average spend of foreign travellers in 2011 in the Balearic Islands: 159€/day <u>Assumption:</u> the spend of domestic tourists is identical to foreign ones' <u>Assumption:</u> 1%³ increase arrivals due to almond blossom
Total monetary value: = 65,388,734 €/yr					Gross of the technology

What recommendations and tips can be given for using the value proposition statement?

The data valorization framework can be summarized by means of the training card illustrated in Figure 25 offers a brief overview of how the framework can be used in practice.

² The blossoming period lasts about one month each year.

³ No data are available on the impact of such niche tourism, so a precautionary approach is taken.

Data valorization framework

What	Framework to help agricultural supply chains to understand the actual value of data and to provide insights on potential further exploitation of available resources. It offers a means of classifying, concretizing and quantifying value exchanges between stakeholders in collaborative business models, which can help shed light on the business case for stakeholders involved.
When to use	• Goal: To identify in an explorative way how value can be created by using data and how this can be concretized. It offers a typology of value exchanges stakeholders may consider and helps stakeholders to get a better understanding of how these exchanges can contribute towards their individual objectives as well as the overall business model objectives. • Stage(s): The data valorization framework is best used in the design or evaluation phase of the SCBMI process. • Type: Can be applied as part of a co-creation or co-evaluation workshop (offline or online) • Time effort: it takes about 2 hours to explore the different value exchanges as part of a SCBM to understand what these exchanges in a broad sense mean for stakeholders. Concretization / quantification can take an additionally 2-5 hours, depending on the detail that is to be included for the calculations.
How to use	• Appoint a facilitator to facilitate the use of data valorization framework. It is also important that the facilitator has a good understanding of the SCBM and the underlying value exchanges that take place. • [Facilitator] If online, prepare a Miro board to support discussion. If offline, prepare a whiteboard which lists the archetypes available • [Facilitator] Invite stakeholders relevant for the respective SCBM The facilitator should also determine whether a single value exchange is explored in-depth or whether multiple value exchanges are explored. The former generates support in terms of concrete decision making (is the business case valid), whereas the latter can serve as a more create ssession. • [Facilitator] Engage all stakeholders – make sure a safe and participative climate is achieved • [Facilitator] Guide the process by filling in the tables relevant for the data valorization framework. This process starts from the enabling factors, after which the benefits are mapped to the respective stakeholders involved. Lastly, the stakeholders focus on the quantification of the benefits appropriated. Note that multiple sessions can be assigned to this quantification process. • [Stakeholders involved for exchange] Determine whether the results are valid. Several iterations can be considered here. • [All] Decide on whether an additional value exchange should be considered or whether the workshop should be terminated. • [Facilitator] Note and summarize the findings of the workshop. Reflect these findings as part of the SCBM
Strengths	• A key strength of the data valorization framework is the fact that value and data exchange which can potentially be valued / monetized is considered from a collaborative perspective (rather than an individual perspective). Generally, data exchange is dependent on more than one stakeholder, meaning that it is key to understand whether it is fruitful to do so for all relevant stakeholders involved. This can help to align the different perspectives of stakeholders in regards to sharing and exploiting data. • The framework offers structure to characterize, concretize and quantify the value of data. It forces stakeholders to become concrete on how this value is to be attained. Accordingly, stakeholders can offer more substantiated claims regarding the value of data, which can help to evaluate the business case or create opportunities for a business case to become viable.
Weaknesses	• It can be challenging to interpret the data valorization framework at first glance and to work with the techniques for quantifying the value of data. For example, understanding which monetization technique (such as Net Present Value) to use and to apply it in practice may take time for users less skilled in financial analytics. Selecting a facilitator with a strong background in business modelling / business casing can help to mitigate this concern. • Although the framework works well in a general sense to characterize and concretize value exchange through data / value of data, it is quite generic and therefore requires some form of interpretation when applied for different SCBMs. Here, guidance may be helpful on how users may apply the data valorization for different SCBM scenarios – for example, certain common assumptions to be made can be listed to help the user get started.
Tips	• When using the framework, be aware that each situation might be different and requires a different approach. It is important to have a proper understanding of the role and objectives of the participating actors and to make sure that each participant's vision is equally considered, and that the resulting benefits are actually beneficial to the stakeholders involved. Ultimately, this is key towards exploiting data as part of SCBMI.

Figure 25 – Training card for the data valorization framework

4 What have we learned from application in practice?

Application of the SCBMI approach in practice has resulted in fruitful learnings and insights on sustainable collaborative business modelling in practice, working towards sustainable impact and rebalancing of current agri-food supply chains. In this section, we delineate the experiences we derived from practice when working with the innovation initiatives. These experiences can be used to further support the application of SCBMI in practice.

4.1 Collaborative business modelling drives decision making

Application of the SCBMI approach for the innovation initiatives in Ploutos made it evident that thinking in business models can help bring organizations together to create and capture value and clarify the role of digital innovations. Using various tools and templates related to business modelling (as introduced in Section 3) offer a concrete perspective to stakeholders. It forces stakeholders to explicate their objectives and considerations and supports the communication of these intentions to other stakeholders. It helps them to reflect on their current position and role in agri-food value chains, as well as aids stakeholders in taking a broad view on how their positioning can be aligned to other stakeholders. As a result, stakeholders can be guided towards shared objectives as well as support making design decisions which synergize with the needs and objectives of other stakeholders involved. As a result, it helps the collective of stakeholders to work towards ‘wicked’ goals such as sustainable impact or societal welfare.

In addition to making things concrete, we also stress the importance of creating a collaborative environment in conducting business model workshops. As illustrated in Section 2, overcoming challenges such as sustainable impact or societal change call for integration and collaboration in current value chains, superceding traditional ‘supplier-customer’ type of relationships (which are often geared towards profit maximization) and rather working towards mutual value creation. Fostering collaboration between stakeholders can help in achieving this. Here, active participation as part of business modelling workshops of all stakeholders is encouraged. Establishing **trust** and **transparency** on how design decisions are made and SCBMs are formed to support sustainable impact is key.

4.2 Value creation and capture in sustainable collaborative business models can be governed in different ways

Working with the innovation initiatives has highlighted the important role of digital innovation in working towards sustainable impact. Digital innovations such as smart farming systems, traceability solutions and parametric insurance or carbon sequestration services can support decision making by farmers or help farmers create additional value supporting their long-term survivability. However, the adoption of digital innovations calls for (upfront) financial investments, shifts in business practices and operations, as well as long-term commitments which are not always easy to realize. Particularly in early phases of adoption the investments in digital innovations do not immediately create sustainable impact which can be capitalized upon. Therefore, it is important to consider how the farmer is supported in its investments in digital innovations. Through working with the innovation initiatives, we observe that different forms of governance structures for value creation and capture can be

selected which can help innovation initiatives overcome these barriers. We can list these options as follows:

- **Farmer-initiated governance structure**

This governance structure reflects the traditional setting in which the farmer makes investments in digital innovation to strive for sustainability. This approach was observed in the Slovenian pilot in Ploutos, in which the farmers purchase a smart farming service (which includes a digital platform as well as agronomic support in terms of advice on fertilizer and water use) from an agricultural service provider. Taking such an approach is possible in case the targeted farmers have access to financial resources to do so and for which the business case of using the smart farming service is evident. The farmers involved in the Slovenian innovation initiative are generally large-scale farmers that can independently sell to retailers or food producers. More so, the farmers have clear benefits in using the smart farming service, as it helps in providing insights on where to use fertilizer or water efficiently. As a result, clear savings in terms of fertilizer and water use can be expected. Logically, subsequent investments in new digital solutions are bounded by the amount of resources available to the farmer. Therefore, this approach should always be considered in light of the conditions and potential savings for the farmer. For example, for farmers with low-incomes, this approach becomes difficult to pursue. We see in the Slovenian innovation initiative that this is partially mitigated through different payment structures (i.e., payback fees instead of lump-sum upfront investments).

- **Farmer-to-farmer governance structure**

The farmer-to-farmer governance structure represents a structure in which farmers *jointly* make investments in digital innovations, either sharing or simultaneously benefiting from their use. Often, this approach is pursued as a result of a cooperative taking charge to strive for sustainable impact. Logically, the benefits for the cooperative increase as more associated farmers start using beneficial (sustainable) digital innovations. Through this structure, the investment barrier for digital innovations is lowered, as it enables farmers to collaborate to access and use digital innovations offered. It also reduces the risk for the farmer, as the investments can be shared. Important to consider for this approach is that the cooperative should foster shared objectives between farmers, as the effectiveness of the use of digital innovations for sustainability for the cooperative depends on the number of farmers participating: if more farmers adopt and use innovations that support the sustainable production of crops, the better the proposition (in terms of selling crops) becomes for the cooperative. This means that even if farmers may not intrinsically be concerned with pursuing sustainability goals, it is worthwhile to understand how these sustainability goals can be connected to other goals (such as financial gains or social wealth) to incentivize farmers to adopt and use new technologies. Therefore, even though farmers who are part of the cooperative do not have to be homogeneous in terms of their individual objectives, the cooperative should stress its core culture and objectives it intends to pursue (and to create traction for these objectives).

- **Retailer-to-farmer governance structure**

The retailer-to-farmer governance structure describes a structure in which the retailer and farmer make mutual investments in accessing and using digital innovations for sustainability. Here, we observe a clear necessity for both the retailer and farmer to intensively work together to achieve sustainability objectives, for example to better cater to current or new customer segments or to differentiate themselves in the market. To achieve this, the retailer and farmer make agreements on how value is created and captured through this collaboration. This approach may entail each party contributing a percentage of the total investments needed to access digital technologies (after which

the profits through sales are shared as well), or may consider farmers making initial investments but being guaranteed to receive part of the added value captured through sales at premium prices. The latter case can be observed in the Dutch carbon sequestration innovation initiative, in which the farmers purchase the carbon sequestration service to further contribute towards their sustainability goals. The biological wholesaler UDEA subsequently guarantees that *any* carbon credits generated through use of the service are bought such that the farmer generates explicit returns on their investment. On top of this, farmers are also able to benefit through any premium price sales UDEA is able to realize as a result of carbon-neutral business operations. Therefore, a symbiotic relationship is established between UDEA and the retailer to strive for sustainable farming practices, in which both UDEA and the farmer are better off in case sustainable impact is achieved. A key challenge to take into account here is that the objectives of the retailer and farmer should be aligned as much as possible. Without such an alignment, it will be difficult to build the symbiotic relationship needed for this approach to take effect.

- **Retailer-directed governance structure**

Lastly, the retailer-directed governance structure means that the retailer actively takes charge in making the investments for farmers to access and use digital innovations. This approach is characterized by a clear motivation of the retailer to achieve sustainable impact. For example, we see this approach occurring in an Italian innovation initiative to protect durum wheat farmers against adverse weather conditions using a dashboard and parametric insurance (which is similar to the Italian vineyard innovation initiative, albeit featuring a retailer directly connected to farmers): the pasta producer Barilla recognizes that in order to improve the sustainability of its food products (e.g. pasta), it needs its associated farmers to be onboarded to provide (sustainably produced) wheat. Seeing the value of digital innovations in pursuing this objective, the retailer actively makes shared investments for the farmer to provide access to farmers to use the proposed decision support system. This enables the farmer (which can be low-income farmers) to both reduce the investments needed to access and subsequently benefit from the use of digital innovations, as well as enables the farmer to share its risks with the retailer. Its advantage is that the retailer moreover can drive a move towards sustainable practices (as it is 'in the lead' in creating access to digital innovations). It does however call for concrete agreements on how value captured (i.e., through the sale of sustainably-produced pasta) consequently is divided. It may also call for incentivization to ensure that farmers use the digital innovations as intended (as farmers may not necessarily share similar objectives). In the Italian durum wheat innovation initiative, this is addressed both informally as well as formally. For the latter, contracts are defined which detail the longevity and nature of the collaboration (e.g., farmers should collaborate with Barilla for at least 2 years) and how the benefits reaped through premium prices are shared. A key challenge to overcome here is the power dynamic that may exist between retailers and farmers, as farmers may have the sense of being 'controlled'. Here, the innovation initiative employs informal mechanisms to build the trust relationship between Barilla and the farmer, in which Barilla provides additional insurance services (as part of the digital innovations offered) to farmers to ensure that in cases of poor weather conditions farmers are protected. Additionally, Barilla communicates its intention to collaborate with farmers post-contract (meaning that farmers can rely on their long-term relationship with Barilla).

The typology of governance structures for value creation and capture in sustainable collaborative business models in the agricultural domain is summarized in Figure 26. The innovation initiatives of the Ploutos project as well as other innovation initiatives in the agriculture domain may build on this typology to support the configuration of their business models.

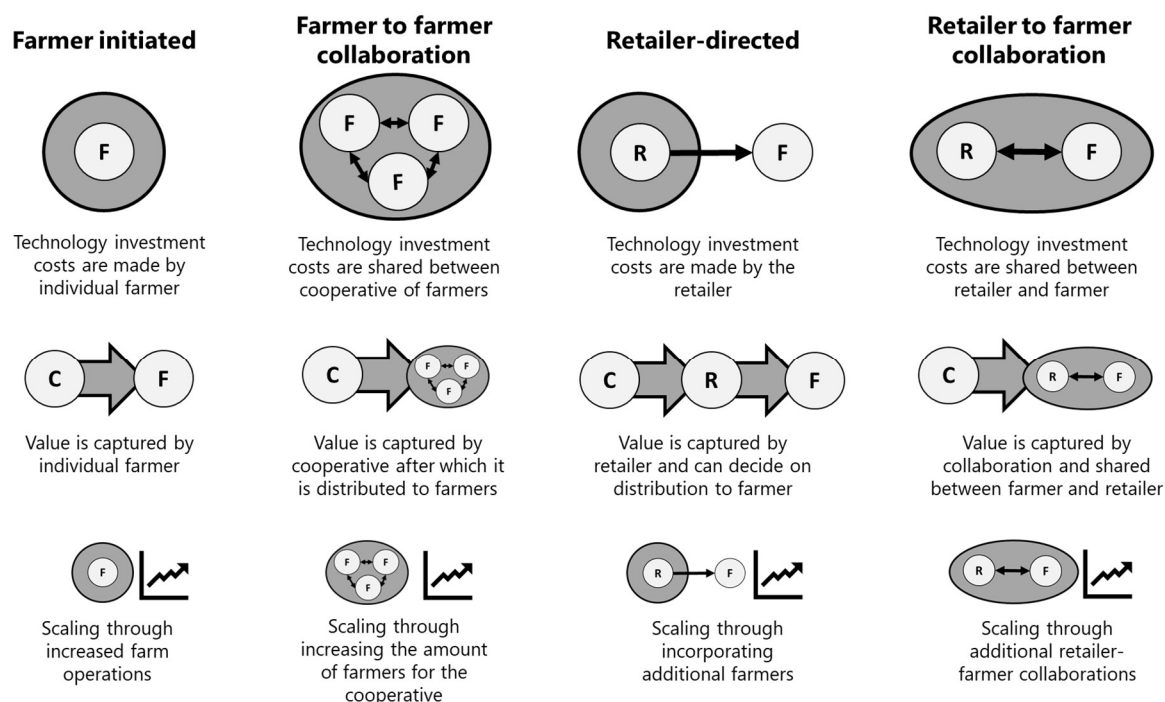


Figure 26 –Typology of value creation and capture mechanisms in sustainable collaborative business models for agriculture

4.3 Farmers can diversify value streams through different roles and collaborations with different domains

Through application of the SCBMI approach with the innovation initiatives, we also recognized that farmers in addition to selling produce to retailers as their key proposition can also diversify their propositions. The insights generated through the Balearic innovation initiative (focused on agri tourism) demonstrate that farmers in addition to their current business model (i.e., collaborate with tourism service providers or orchestrate local services with restaurants or other activity providers) can offer secondary value propositions to customers. In doing so, they can enter new markets (tourism proposition) or reposition themselves for existing value chains (local solutions), which connects to the sustainable business model archetype of *shortening the value chain* (further described in D3.4). Similarly, the results from the Italian innovation initiative and the Dutch innovation initiative show that through digital innovation, transparency can be created on the sustainability of farming operations. This enables farmers to focus on the generation of carbon credits in addition to its existing operations. These carbon credits subsequently can be sold to generate additional value streams for the farmer (allowing farmers to improve their position in the value chain). This corresponds to the sustainable business model archetype of *provisioning of ecosystem services* (i.e., rewarding environmental positive behaviour and actions).

Related to selling transparency, we observe in the Slovenian innovation initiative that sustainable efforts by farmers can also be linked to subsidization and government funds. Their soil passport service enables farmers to be rewarded for their efforts if they comply (or work towards) national legislation. Accordingly, in addition to the regular sales of produce to food producers, farmers can therefore also generate returns through accessing value streams which reward sustainability.

It goes to show that there are many directions towards value creation that can be considered by farmers to improve their current position in value chains or to capture sufficient value in return. Thinking in a *portfolio of business models* (i.e., many concurrent business models which offer different

value propositions or target different customer segments) rather than in a *singular business model* (i.e. one dominant business model configuration which offers limited opportunities for further differentiation) can help farmers to be respond to unexpected or unfavorable market outcomes.

4.4 Explore alternatives, experiment and learn during the process of sustainable business modelling

We also stress the importance of exploring alternatives and to iteratively develop these business models over time, scaling the business models through trial-and-error learning. These strategies can take effect in terms of *increasing the user base* (for example observed in the Italian vineyard innovation initiative, in which additional farmers over time will be included to support the adoption of digital innovations), *increasing access to resources* (for example observed in Dutch carbon sequestration innovation initiative, in which alternative means of finance are explored or are in motion through transfer of intellectual property), or in terms of *diversification of value propositions* (increasing the amount of services being offered, for example the case in the Balearic innovation initiative). We see that even though the impact logic defined for the SIPs seems sound on paper, there are many assumptions that underlie this narrative, which are critical to the success of the business model in practice. Such assumptions need to be validated in order to provide support and commitment towards future business models. Creating sustainable impact calls for a careful consideration of how business models developed are scaled over time, which relies on learning and experimenting by doing. Again, a portfolio strategy in which multiple business models are considered can help here to reduce the overall risk that farmers may experience when doing so.

5 Conclusion

In this section, we conclude this deliverable, summarizing the consolidated SCBMI and providing pointers for further reading.

5.1 How can we summarize SCBMI?

To deal with societal and environmental challenges, which are affecting our livelihood as well as our surroundings, systemic change is needed to transition towards sustainable business practices. This is no different for the agri-food industry, which is faced by challenges such as economic disparity between value chain stakeholders, significant dependence on natural resources and significant emissions as a result of agricultural practices. To support the survivability and sustainability of this industry, innovation is needed.

In addition to technological innovation and behavioural innovation, business model innovation is key to realise these changes in practice, explaining how stakeholders as part of agri-food value chains reposition themselves to create and capture value and to contribute towards sustainable and societal impact. It clarifies how new technological innovations are used to enable this new logic, as well as describes what different behaviours should be exerted to foster change.

However, business model innovation in practice tends to be messy and complex, with many stakeholders and facets to consider. More so, as value chains are often interrelated, featuring many stakeholders working together but pursuing diverse objectives, systemic change can only be enabled if such motivations are aligned as much as possible. To support business model innovation in the agri-food industry, in this deliverable, we have proposed the *sustainable collaborative business model innovation approach* (SCBMI): it explains how stakeholders in agri-food value chains can structure business model innovation, building upon core principles such as *multiple value creation*, *farmer centrality* and *mutuality*. It emphasizes taking a holistic perspective on current agri-food value chains and the need for collaboration to achieve sustainable impact, which affects but also depends on all stakeholders within this chain. It calls for establishing trust and long-term relationships between stakeholders to foster cooperation and systemic change.

Our SCBMI approach consists of five iterative phases which shed light on how value chain stakeholders can innovate and design their business models to create sustainable impact and to explore the role of digital innovation in doing so. To support this process, we have offered a workshop-based format, as well as tools to support its operationalization and use in practice:

- *A set of reference sustainable collaborative business models for the agri-food industry*, supporting the ideation and exploration of new business models
- *A toolbox of methods and techniques to support business model analysis and design*, supporting the configuration and design of new business models
- *A data valorisation framework for identifying, explicating and concretizing value exchanges as part of new business models*, supporting the exploitation of new business models.

We provide the following recommendations when using the SCBMI:

- SCBMI requires all stakeholders relevant for the future SCBM to be represented and voiced to realize systemic change. It is key to understand the drivers and motivations of each stakeholder involved, such that common goals and objectives can be established. It is vital to understand the dynamics between stakeholders (in terms of their perceptions and potential conflicts of interest) to stimulate trust and cooperation. Only then can collaborative business models succeed and thrive in practice. Without mutuality, the individual motivations of stakeholders will be difficult to align, particularly in cases in which value capture is positioned downstream, and actors upstream (such as farmers) have limited control over how this value is shared.
- The effectiveness of SCBMI can be improved if innovation initiatives are wary of their respective maturity and intentions. Before SCBMI is initiated, initiatives should have a clear idea of what objective or what challenge they are intending to solve, and what outputs (i.e., business models, identification of solution directions, strategies for scaling) would help in solving these challenges. For example, is a clear need identified for one or more stakeholders which drives business model innovation? Conversely, is the innovation initiative seeking to capture value through technological innovations? Understanding the goal and objective as to why business model innovation is needed can help in creating focus on specific phases of SCBMI. As explained, some initiatives may be focused on scaling their business model to increase their sustainable impact. In such cases, emphasis should be placed on late phases of SCBMI, in which the business case supporting the SCBM is key to validate. Conversely, some initiatives may focus on establishing new collaborations and creating a landscape for new value propositions. Here, the analysis and design phases of the SCBMI help in exploring this.
- SCBMs can be leveraged in parallel to create sustainable impact – these business models can operate simultaneously and generate value which can be exchanged between models. Accordingly, challenges such as financing can be overcome through employing multiple business models and can help lower the barrier for farmers or other stakeholders to invest. We have seen many instances in which service or technology providers employ different subscription models for their smart farming solutions to support farmers with either high or low incomes. Through additional value captured from high income farmers (which can in return benefit from additional features or access additional decision making support), such technology providers are able to offer more lean solutions at a lower cost to low income farmers. Through this configuration, the technology provider is able to service a larger portion of farmers. As a result, more farmers can be equipped to foster sustainable farming practices. Employing multiple business models can also help to reduce entrepreneurial risk. For example, value chain stakeholders can continue to operate their current business model whilst gradually exploring whether a new SCBM is worthwhile to scale. Through such a pilot, limited costs are incurred (which can be funded through the current business model), yet enables stakeholders to investigate whether a new SCBM can contribute towards sustainable impact.

5.2 What more can I consider in the context of SCBMI?

As indicated, business model innovation goes hand in hand with behavioural and technological innovation. A technological innovation is not intrinsically valuable unless supported through a sound business model, which may require adapting the current business model. This implies changes to behaviour needed to realize this change in practice. Conversely, technological innovations may also enable new business models: data-driven analytics enable service providers to offer different or

enhanced value propositions, allowing such organizations to delve into new markets or to better cater to consumer needs. Accordingly, it is important to understand what behavioural changes can be observed for the consumer in using a novel service, and to investigate how the business model supporting the service should be shaped.

As part of Ploutos, both the behavioural and technical perspective have received attention as part of the Sustainable Innovation Framework. The following deliverables can be considered as valuable guidance (in addition to this deliverable) on how digital innovation in the context of the agri-food domain can be supported:

Ploutos D2.5 – Ploutos Sustainable Behavioural Innovation Toolbox

Ploutos D4.10 – Ploutos Consolidated Data-driven Innovation

5.3 Final Remarks

The publication of this document marks an important milestone for the development of key enabling methodologies in context of the great societal challenges. In this document we present and illustrate a complete and practical method, we call SCBMI, for the development of collaborative business models aimed at establishing sustainability, focused on the context of digitalization in the agrifood sector.

Our societal challenges demand organizations in value networks to change in concert, however a validated method was thusfar lacking. Such a method should engage diverse stakeholders in collective action, by creating shared understanding, trust and vision, and aligning their innovations based on technological interdependencies. It should have a clear view on how innovations create and capture value for its end-users, and the wider value chain actors, while also pointing to behavioral aspects involved in implementing and utilizing the innovations. It should make clear how the innovation is achieving sustainability targets, and how it can achieve substantial scale and impact.

We took on the challenge to develop such method. Following a design science approach, we iteratively developed a participative design thinking method, linking analytical and creative tasks. We validated it in practice by applying it with ten innovation initiatives.

Helping these initiatives move forward using insights from the SCBMI activities, this has resulted in a specification of the method and an operationalisation of the method in the context of targeted workshops. In these workshops we suggest the use of several tools, which we describe and present. The tools are further explained in accompanying videos and training cards. The application of the method and the tools is illustrated with examples from the participating innovation initiatives. Furthermore the resulting method is also presented in a handbook for sustainable entrepreneurship and findings of the applications in practice are represented in journal articles.

Based on the above, it is our belief that this package can support initiatives in guiding their business modelling work, feeding into further valuation, risk assessment, decision making and implementation of innovations aimed at establishing sustainability. This, however, does not guarantee the success of initiatives, although identification of innovation risks is embedded in this process, but at least it can guide initiatives along the key questions related to technology, customers, stakeholders, impact, value and their interrelations.

Our endeavour does not stop here, as this approach only enables the realization of impact. Consequently, our next efforts are aimed at supporting initiatives further to create impact and address our societal needs.

6 References

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