D3.11: Final Ploutos SCBMIs and data/service valorization for pilots

WP3 – Sustainable Collaborative Business Model Innovation

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Executive summary

The Ploutos project revolves around a number of sustainable innovations, which are piloted in the Ploutos Sustainable Innovation Pilots (SIPs). In order to shape and maximize the probability of value creation and capture, these innovations are supported with an innovative and participative approach for designing and evaluating Sustainable Collaborative Business Model Innovations (SCBMIs), as defined in *D3.1: Ploutos SCBMI approach - initial version*. This approach is iterative in nature and will run over the course of the Ploutos project, during which input on the requirements and characteristics of the business model for each SIP is generated and subsequently the business models are designed and further developed to effectively support the innovations central to each SIP. Therefore, the business models are gradually improved upon during the SCBMI approach.

In this report, we present the final outputs on the business model design(s) developed through the SCBMI approach. Additionally, we describe the *pathway towards impact* for each SIP to help understand how the business models will be implemented and operationalized. Lastly, we describe the next steps SIPs will take regarding their business model outputs to work towards the realization and adoption of digital innovation in practice to support sustainable farming practices.

This report also captures the perceptions of SIP stakeholders regarding their participation in the SBCMI approach. It details to what extent stakeholders deemed the SCBMI approach and its outputs useful and to what extent the SCBMI approach was easy to use. These insights are used as recommendations for future use of the SCBMI approach.

Through the work with the SIPs, we also draw general conclusions regarding sustainable collaborative business modelling in the agriculture domain, which support the realization and adoption of digital innovations for sustainability in practice. Based on our findings, we conclude that different investment structures can be considered to support the adoption of digital innovations by farmers. For example, farmers may rely on cooperative-like structures to make shared investments in new digital innovations. As a result of bundling financial resources, it lowers the financial barrier for farmers to invest in digital innovation and to reap its benefits. Similarly, farmers may also collaborate more intensively with retailers or food producers to work towards sustainability goals. Through appropriate value sharing of products sold at premium prices or through return-on-investment structures (for example in the case of carbon sequestration), farmers can consequently fund the use of digital innovation in practice.

In addition to the above, farmers can also diversify their propositions to access different value streams. Here, farmers may consider repositioning their offerings (shortening the value chain through different sales points or through local sales), may venture into different markets (for example to collaborate with tourism service providers) or may leverage data or transparency to create additional value.

Lastly, a holistic consideration of value chains can help foster relationships between organizations. This can help align operations between value chain organizations and subsequently improve the offerings that can be brought to market. Moreso, the role of partners to the value chain (technology providers, insurance providers, agronomist services) can be leveraged to further improve value chain collaboration. In addition, the importance of exploration when conducting sustainable business modelling is stressed. It is not evident to find a suitable configuration at first glance; trial-and-error learning can help to overcome initial barriers and can ultimately lead to a configuration that works. Subsequently, stakeholders can gradually scale the business model over time to achieve impact.

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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 *D3.11: Final Ploutos SCBMIs and data/service valorization for pilots* describes the final outputs generated for the SIPs through the application of the SCBMI approach. This entails a finalized sustainable collaborative business model design for all SIPs, concretizing the business model designs and impact logics introduced as part of D3.10.

In addition to the business model design and impact logic, we also describe any ad-hoc work conducted with the SIP. As SIPs can have different goals to achieve for the SCBMI approach (i.e., to focus on identifying a suitable SCBM, scaling an existing SCBM or structuring the innovation landscape to support and ideate new value propositions), different outputs as part of the ad-hoc part of the SCBMI approach have been generated to support decision making for the SIPs or to overcome challenges posed for the SIPs. SIPs were invited to call upon ad-hoc workshops to investigate and address these challenges – as a result, a subset of SIPs (namely SIP 3, 4, 6, 9) include ad-hoc findings supporting their SIP context.

Next, based on the findings generated, we present general conclusions on supporting digital innovation for sustainable impact in the agriculture domain. Here, we explain how the business model can be used to deal with common agriculture challenges such as imbalances for current value chains, lack of supply chain coordination to support transparency, or difficulties of supporting the adoption of new digital innovations to support farmers.

Lastly, we have elicited from each SIP to what extent the outputs produced through the SCBMI approach have *satisfied* the needs of the SIPs or supported decision making, and to what extent the results can be used to support subsequent innovation activities in the context of the SIP. This input helps us to reflect on the value of the SCBMI approach – what aspects were appreciated and how can the SCBMI approach further be improved? It also helps us to understand what next steps will be undertaken by the SIPs to work towards achieving their goals.

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Summarizing, this deliverable documents:

1. The final SCBM and impact logic obtained for the SIPs
2. The outputs of the ad-hoc part of the SCBMI approach based on the needs of SIPs (for a select set of SIPs)
3. Challenges faced by the SIPs and the next steps to work towards realizing the innovation goals set
4. The reflection of the SIPs on the value of the SCBMI approach in addressing their needs
5. The general business model findings and conclusions for supporting digital innovations for sustainable impact in the agriculture domain.

This deliverable is the final deliverable of three versions covering the Ploutos SCBMIs results (the previous iterations being D3.9 and D3.10 – D3.11 encapsulates the results of these deliverables). SIPs can / should build upon the outputs reported in this document as a basis for further concretization and realization of innovations or as a means to pursue their innovation goals set.

1.3 Document Structure

The document is structured as follows:

- **Chapter 1** presents an introduction to the project and the document.
- **Chapter 2** summarizes the Ploutos SCBMI approach, which is used for supporting the pilots in this project, and briefly covers the methodology followed for this deliverable. For a detailed explanation of the SCBMI approach, we refer the reader to D3.2 – Ploutos SCBMI approach – final version.
- **Chapter 3** describes the final sustainable collaborative business models as well as pathways to impact obtained through application of the SCBMI approach. The context and objectives of each SIP are briefly reintroduced. This chapter will also document the ad-hoc results obtained per SIP (if applicable) through the SCBMI approach.
- **Chapter 4** provides an overview of general insights and recommendations for sustainable collaborative business models in agriculture to support the adoption and use of digital innovation in practice.
- **Chapter 5** delineates the reflection of the SIPs regarding the SCBMI approach. It explicates to what extent the SCBMI approach has supported SIPs in their decision making and to what extent the SCBMI can be considered valuable.
- **Chapter 6** provides a recap of this deliverable and lists the conclusions and opportunities for future research for the pilots.

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2 Ploutos SCBMI

In this chapter, we briefly recap the Ploutos SCBMI approach, explain how this approach links to other work packages and describe how the corresponding workshops can be prepared, executed, and processed. More details on the methodology itself can be found in *D3.2: Ploutos SCBMI approach – final version*. Additionally, we briefly describe the methodology employed for gathering the information and results covered in Chapter 3.

2.1 The Ploutos SCBMI approach

The Ploutos SCBMI approach is a process that facilitates the design and evaluation of business models (through employing interactive workshops and tools) that create and capture sustainable values by the participation of multiple organizations. Such an approach is not readily available, yet it is needed in the context of the digital and sustainable transition in agriculture which requires the business models of supply chain actors to change in a coordinated way.

Our SCBMI approach consists of nine steps which are executed sequentially, of which the first 7 steps are key to the core process of the SCBMI: these steps actively contribute towards supporting decision making on new business models. These steps can be grouped into phases related to *analysis, design* and *evaluation* of the business model and business context. Once commitment is achieved, stakeholders can actively work towards (dedicating resources towards) actual business model implementation and, over time, scaling. The first phases should already take into account how likely these scaling intentions will be (as part of the assess and evaluate steps). An overview of the SCBMI approach is illustrated in Figure 1.

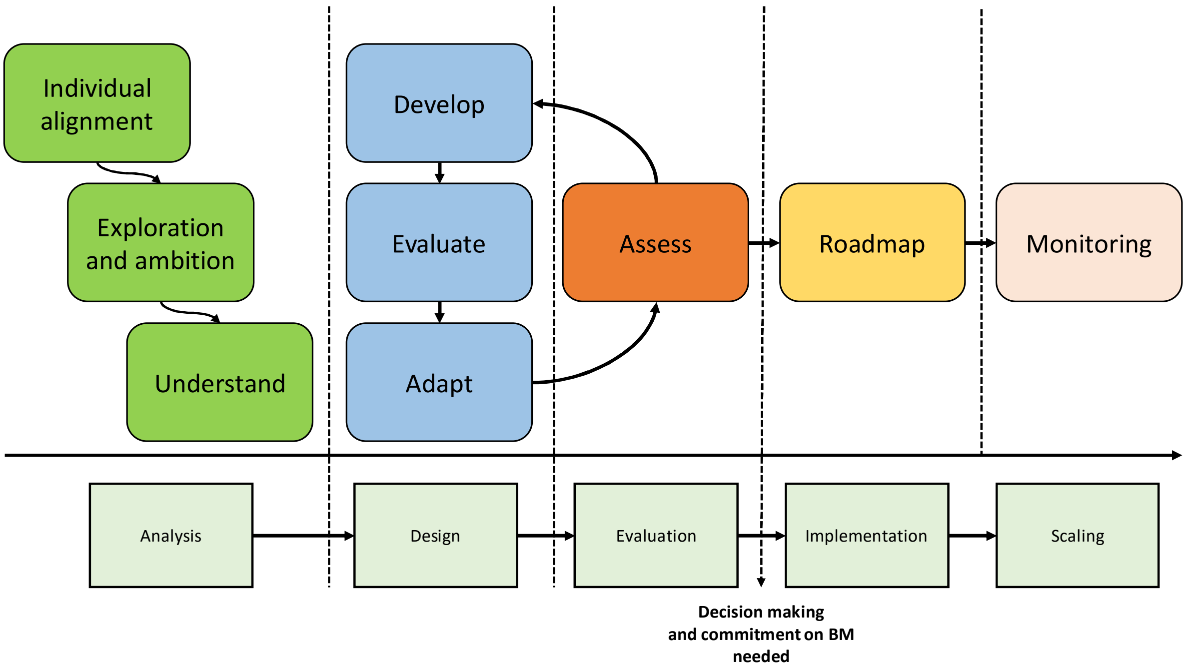

Figure 1 - Overview of the Ploutos SCBMI approach

The first phase, the analysis phase, is focused on laying a mutual foundation. Three steps (Individual Alignment, Exploration and Ambition and Understand) are executed in sequence in order to gather all relevant information for the pilot at hand, such as the ecosystem in which it operates, its local context and the current business model as well as the ambitions and strategies from the partners. Moreover,

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a shared vision to work towards for the pilot is formed during this phase. To support the communication of motivations and ambitions, this step can be supported through 1-to-1 sessions to capture the true motivations of stakeholders.

In the second phase, the design, the novel business model is constructed in an iterative process where an initial design is created and evaluated, adapted and assessed in close collaboration with the SIP partners until a satisfactory result is reached. The overview of reference SCBM archetypes (see *D3.2: Reference sustainable collaborative business model archetypes*) serves as a valuable basis here. In any case, the Ploutos Principles (mutuality, farmer-centricity, multiple values and scalability) are core considerations in designing the collaborative business model. Any business challenges identified (be it technical, social, or financial) should be captured and, if possible, addressed, whereas critical assumptions should be reflected on.

Once the sustainable collaborative business model has been designed, the evaluation phase takes place. Here, the goal is to assess the long-term survivability and feasibility of the business model design and to understand to what extent the Ploutos principles have been fulfilled. It also zooms in on the scaling intentions the SIP may have regarding the solution and its associated business model design. This phase is generally iterative with the design phase: evaluation may raise challenges and barriers previously unaddressed, which pose potential changes for the business model design. This can result in several design and evaluation iterations before a valid and viable business model design is achieved. To progress to the next phase, commitment of all stakeholders is needed on the business model.

The next phase will be to create a roadmap to ensure that the business model design is gradually implemented over time and to realize the plans made in earlier phases. Potential scaling strategies selected should also be defined further, whereas it should be assessed to what extent the business model *works* in practice.

The final phase focuses on whether the sustainable collaborative business model remains viable and scalable in the future. It entails a plan for the years to come, including a strategy to scale the business model up to a level that in principle should make it applicable in other regions of Europe.

The first three phases (analysis, design and evaluation) constitute the *core part* of the SCBMI approach. These are highly structured in nature and address the various concerns that should be explored to support sustainable collaborative business model design. This part can therefore be characterized as *generalized* and largely similar for all SIPs. The latter two phases (implementation and scaling) are tailored to the specific needs of the SIPs. From a business perspective, some SIPs may be more mature than others and therefore face vastly different challenges or have different needs regarding business model design. Therefore, this part of the SCBMI approach can be considered as user-inferred: depending on the needs of the SIPs, we zoom in on specific parts of sustainable collaborative business modelling.

To support the core SCBMI approach, a workshop-based setup can be followed. In Ploutos, the workshop-based setup as illustrated in Figure 2 is applied to support SCBMI. A brief rundown of each workshop is presented below.

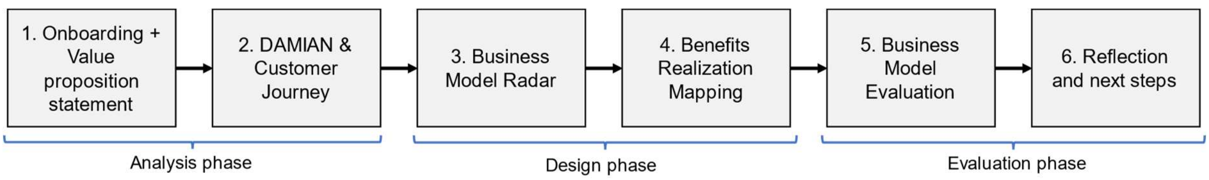

Figure 2 - Workshop sequence to support SCBMI

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Workshop 1 – onboarding and value proposition statement, serves as a soft entry in the SCBMI approach. In this workshop, the goal is to understand the objectives, motivations, and perceptions of stakeholders to be involved for a project or SIP and to see whether such perspectives can be aligned. SCBMI is very much a *collaborative*, *multi-stakeholder* approach: if stakeholders have different motivations or have vastly different objectives, this can create conflict or hinder the development and roll-out of innovative solutions as the project progresses (as for example stakeholders are only motivated by financial gain or do not consider the same scale for solution roll-out). It is also important to understand to what extent stakeholders have experience in business modelling and what their current role is for their respective organization: will you need additional support to help them make business decisions or can potentially parts of the process be accelerated as stakeholders are aware of business challenges faced? Workshop 1 is concluded using the value proposition statement – the stakeholder group should shed light on the innovative solution under consideration and collaboratively discuss *for whom (customer / end-user*) this solution is valuable and *how* its use enables *value creation for this customer / end-user*. Note that the Ploutos principles (farmer-centricity, mutual value) should drive discussions on how value is created. Any differences of opinion should be resolved before the next workshop is started.

Workshop 2 – DAMIAN and Customer Journey continues the discussion on the innovative solution, investigating *how* the solution will be used in practice by customers / end-users and *what* is needed to support the solution (in terms of stakeholders and technical background). It should be clear what steps the end-user / customer will take to use the innovative solution to create value and what efforts of stakeholders are needed to support this. This should be coupled to a discussion on what data is collected (and by whom) and whether this facilitates value creation (or could potentially destruct value due to privacy issues or due to the efforts needed by end-users). After workshop 2, the stakeholder group should fully understand how the solution will work in practice and what resources are needed to support its use.

Workshop 3 – Business Model Radar focuses on the design of the business model, exploring the business structure appropriate to support the innovative solution and understanding the costs and benefits that can be appropriated for stakeholders involved for the business model design. After this workshop, it should be clear what stakeholders take part for the business model design, why they are involved (what value do they contribute?) and how each stakeholder is able to capture value in return (generating a positive balance of costs and benefits) as a result of participation. It should also become apparent how the business model design can adjusted strategically to account for the motivations of each stakeholder (do we want to pursue this business model) and what potential business challenges exist towards its implementation. Workshop 3 is concluded with a draft business model design as well as an indicative analysis of what costs and benefits each stakeholder receives through participation.

Workshop 4 – Benefits Realization Mapping analyzes the operationalization of the business model design. Here, stakeholders should investigate through benefits realization mapping whether each step towards value creation can be executed or whether the necessary resources and capabilities are in place to do so. Stakeholders should challenge each step to identify possible implicit assumptions made for the business model design or challenges that should still be resolved. It also clarifies in detail what is asked from each individual stakeholder involved. Next to operationalization, the consortium / stakeholder collaboration should also zoom in on how the business model design will be scaled to achieve the impact goals set for workshop 1. Any changes required to the business model design as a result of BRM should be documented and made.

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Workshop 5 – Business Model Evaluation concerns a final business model 'check'. In this workshop, the business model design is considered in light of its desirability (how does it create / destroy value for end-users / farmers?), viability (how does it create / destroy value for stakeholders involved, both economically, socially as well as environmentally?), feasibility (what challenges do we still see towards business model implementation?) and robustness (to what extent can the business model design react to external changes?). Stakeholders should collaboratively discuss each criteria and judge or 'score' to what extent the business model performs for each criteria. If the business model design does not perform well for a certain criterion, 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 and covers any ad-hoc steps that may be considered. Here, the stakeholders involved reflects on the outputs of the SCBMI approach and plans the next steps and actions towards execution. The SCBMI approach supports in this through ad-hoc discussions or sessions with the stakeholders (for example through exploitation plans or inputs for cost-benefit analyses). In case business model tests are specified (to validate assumptions uncovered through BRM) or specific challenges are still present, these serve as the starting point for further business model refinement or implementation.

2.2 Methodology followed

To describe the business models applicable for the respective SIPs as well as to understand and analyze the impact logic supporting these business models (described in Section 4), we built on the results generated through the SCBMI approach as well as 1-1 meetings held in the context of WP1 with the SIPs. The approach focuses on the design, evaluation and implementation of sustainable collaborative business models supporting the innovations in Ploutos for the various SIPs. Key activities of this approach are the design of *sustainable collaborative business models* supporting the innovations as well as mapping of the *impact logic* supporting the business models. These activities are incorporated as part of workshops supporting the SCBMI approach, which generally occur at the design phase of the 'core part' of the SCBMI approach and is evaluated for the evaluation phase.

In terms of ad-hoc work conducted with the SIPs (relevant for SIPs 3, 4, 6, 7 and 9), we built upon results generated through additional workshops orchestrated as part of the SCBMI approach. These workshops were specifically geared towards the challenges faced by the SIPs to help them realize their objectives or overcome certain barriers faced.

To capture the perspective and feedback of the SIPs on the SCBMI approach, we developed a short survey which has been sent out to all stakeholders that took part in the workshop (see Section 5). Using this survey, we collected insights on the perceived usefulness and ease-of-use of the SCBMI approach. Additionally, we also asked stakeholders to indicate the degree to which the SCBMI helped them to realize new collaborations or strengthen existing ones, as well as to explicate next steps regarding business model development. These insights are detailed in Section 5.

Finally, we used the insights generated per SIP to draw general conclusions for sustainable collaborative business modelling to support the realization of digital innovations in practice and to contribute towards sustainability and rebalancing of the value chains. We did so through a cross-comparison of business models and impact logic templates generated per SIP, using an abductive reasoning approach. To support this process, four researchers with a significant background in business modelling were involved. Commonalities between SIPs were coded and discussed afterwards to distill general conclusions for sustainable collaborative business modelling (presented in Section 0).

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3 Description of the business model and analysis of the impact logic

In this chapter, we describe the sustainable collaborative business model design(s) that fit the innovations in the respective SIPs as well as the pathway towards (long-term) impact. On the basis of this, we list the strategic and business challenges that are still faced and should be addressed to support business model implementation and execution. Accordingly, per SIP, the following aspects will be described:

- Solution and value proposition
- Collaborative business model design(s)
- Impact logic (using benefits realization mapping)
- Strategic implications and challenges faced
- Ad-hoc support offered to SIP to support business model design (if applicable)
- Next steps (post Ploutos) to be taken by the SIP

3.1 SIP 1 – Frozen Fruits[1]

3.1.1 Solution and value proposition

Fruit producers in Greece, like Proodos Farmers' Union, face sustainability problems, as their farms are small, fragmented and in different microclimate zones, facing high inputs costs, lack of financial resources for investments, and they use old production methods that result in increased inputs consumption while damaging the environment.

SIP 1 aims to help in this situation by offering a smart farming solution (i.e. Gaiasense) to farmers as well as a traceability solution that is offered to Alterra (and by extension to farmers). The smart farming solution provides advice to farmers to improve their efficiency of farming practices and to reduce the use of resources based on data (from sources such as sensors in the field, farm calendars, analyses and observations of agronomists). A part of this data, focusing on the farm log and the various recorded applications/work in the field (i.e., irrigation, spraying pesticides etc.) is also fed into the traceability solution: this will help in collecting all the needed data/proof to secure certification and sustainability related labels. As a consequence, Alterra can use this to extend its value proposition to its customers interested in buying frozen fruits (companies such as Danone): these customers can now make explicit how the fruits used for their products are developed and where these fruits originate from. In addition, the sustainable nature of the fruits used can be highlighted. In turn, this can justify a premium price to be paid for the fruits used (which means that increased value can be captured by the farmers in return).

3.1.2 Business model design

The business model design which emerged through the SCBMI process for SIP 1 is illustrated in Figure 3. The central value-in-use is *transparent, sustainable and qualitative frozen fruit products.* The customer / end-user selected for the business model design is **Buyer of frozen fruits** (in this example Danone), which buys the frozen fruits from Alterra and can make claims on the sustainable quality of

[1] The SIP "nicknames" have been obtained in the workshops with SIP leader in which the SCBMI approach was presented.

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the fruits used. As a result, buyers of frozen fruit (Danone, but also other potential customers of Alterra), are able to capture the following benefits (green) and costs (red):

- Sustainable quality products, as it can be made explicit how the fruits used have been + produced (sustainably)
- Data from field to fork, enabling Danone to provide insights to customers on how the products have been produced and where
- Higher price paid for the fruit to compensate for the additional value proposition connected to the fruits (traceability of how it has been produced). This is dependent on the type of consumer that is considered: for example, consumers can be considered that are willing to reward this additional value proposition. It could also be the case higher price markets are achieved as a result of complying to stricter regulations (being able to make explicit that the fruits have been produced in a sustainable manner).

The central value-in-use (*transparent, sustainable and qualitative frozen fruit products*) is established through collaboration between Alterra, Proodos, Novaplan, NEUROPUBLIC and the individual farmers. In the current business model design, Alterra is selected as the orchestrator, serving as the direct interface to Danone or other interested purchasers of frozen fruits (willing to capitalize on sustainability claims). As part of the SCBMI approach, WP3 will further investigate with SIP1 who will take the orchestrating role for the business model design.

Proodos is responsible for the stability of high quality and sustainable fruits. This is done by using the smart farming service and linking barcodes in their farm logs for use in the traceability solution at Alterra (such that Alterra can make insightful how, where the fruits have been produced). They benefit through business model participation through lower production costs (reduction of water usage, pesticides / fertilizer needed) and a stable production through smart farming service use. Additionally, increased revenue can be expected as a result of premium prices that can be captured by Alterra (selling traceable, higher quality fruits to buyers of frozen fruits). Proodos will pay a subscription fee to NEUROPUBLIC to access and use the smart farming solution. This subscription fee is based on surface of fields supported through the smart farming service. On the basis of how participating farmers use the available surface, this subscription fee is subdivided over the participating farmers.

Novaplan offers agronomist services to farmers of Proodos (note that they also provide agronomist services to farmers outside of Proodos as well). To do so, Novaplan leverages data and the data-driven advice generated through the smart farming service and collaborates with individual farmers on how to apply it in the field to improve (sustainably) their farming practices on pest management, irrigation and fertilisation. Ultimately, farmers and Novaplan decide on what actions are taken for the fields, using the data and data-driven advice to guide this decision making. These services are compensated by Proodos by means of paying an agronomist fee. Logically, costs (in terms of employees and overhead) are expected to provide these services.

NEUROPUBLIC is responsible for generating data-driven advice on farming practices (pest management, irrigation and fertilization) to support farmers / agronomists in data-driven decision making. They do this through providing the smart farming service (Gaiasense): this entails placing IoT weather service stations on the field, combining them with data coming from the various sources and analyzing them to feed their scientific models and decision support system, which generate advice based on the data that is collected. In addition, they offer a traceability solution to Alterra (and by extension, Proodos) such that it can be made insightful how and where fruits have been produced. For providing the traceability solution and smart farming service, an annual subscription fee is received from Proodos / Alterra. In addition to this fee, NEUROPUBLIC benefits by having access to farmer

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calendars and improving their smart farming services and other models with the new data. As a service provider they get paid for by their annual subscription offered. Costs are related to infrastructure, creating, operating and maintaining the software, supporting the end users of Gaiasense and the traceability apps.

Alterra takes responsibility for sustainable qualitative products and stable sales by operating the traceability solution. For this agronomists from the quality department are involved during production, in the warehouse management system, and registering the barcodes. They benefit from easier data processing and access. It is also expected that they are able to generate a premium price for the frozen fruits from the frozen fruit buyer (as they are able to provide sustainably produced frozen fruits and can explicate this claim through the traceability solution). Operational costs are expected for Altera in terms of handling and packaging the fruits and the operation of the warehouse management system. Additionally, a subscription fee is paid to NEUROPUBLIC for using the traceability solution.

Lastly, the **Farmer** is involved to adopt the smart farming service, to integrate the advice given as part of its farming practices and to log its cultivation practices for the smart farming service. They are part of the Proodos Farmer's, but logically also create and capture (individual) value through use of the smart farming service. Their value proposition therefore is related to the sustainable production of fruits, and providing data to support sustainability claims. Through use of the smart farming service, the farmer is able to benefit from a reduction in terms of inputs needed as well as improved efficiency / reduced production costs. Additionally, the smart farming service also eases bureaucratic concerns for the farmer. Lastly, the farmer is expected to capture additional revenues as a result of premium prices that can be achieved by Alterra. To use the smart farming service, farmers pay a percentage of the subscription fee paid to NEUROPUBLIC (depending on how large their area is that is supported through the smart farming service).

3.1.3 Impact logic

The impact logic for SIP 1 was collaboratively mapped with key stakeholders of the business model, using Benefits Realization Mapping. The illustrated model in Figure 4 highlights the logic behind the outputs.

The deliverable of this SIP encompasses the development of an agri-food data sharing framework and integrated smart farming approach provided by Gaiasense. This innovative solution facilitates efficient farming practices by offering real-time access to data through a traceability solution. Barcodes are utilized to establish sustainability claims, while also enabling the estimation of yield quality.

From a business and behavioral perspective, this entails that farmers are expected to log their cultivation practices on a weekly basis and share this data with the entire value chain. This collaboration optimizes the utilization of the solution. Farmers undergo training to familiarize themselves with the accompanying app and comprehend the insights it provides. Additionally, Novaplan conducts site visits to engage in improved communication with farmers, develop strategies, and provide training. Neuropublic adapts Ploutos interoperability enablers to align with the technical specifications of participating systems, harmonizing them and enhancing communication with all partners. Alterra reorients production towards quality, necessitating additional personnel to design production and implement changes based on the new information. They also address inquiries from end consumers regarding the product. Proodos maintains detailed records of producers' data, noting any observed changes, and provides training to farmers. Retailers handle a greater volume of data and translate it for better understanding.

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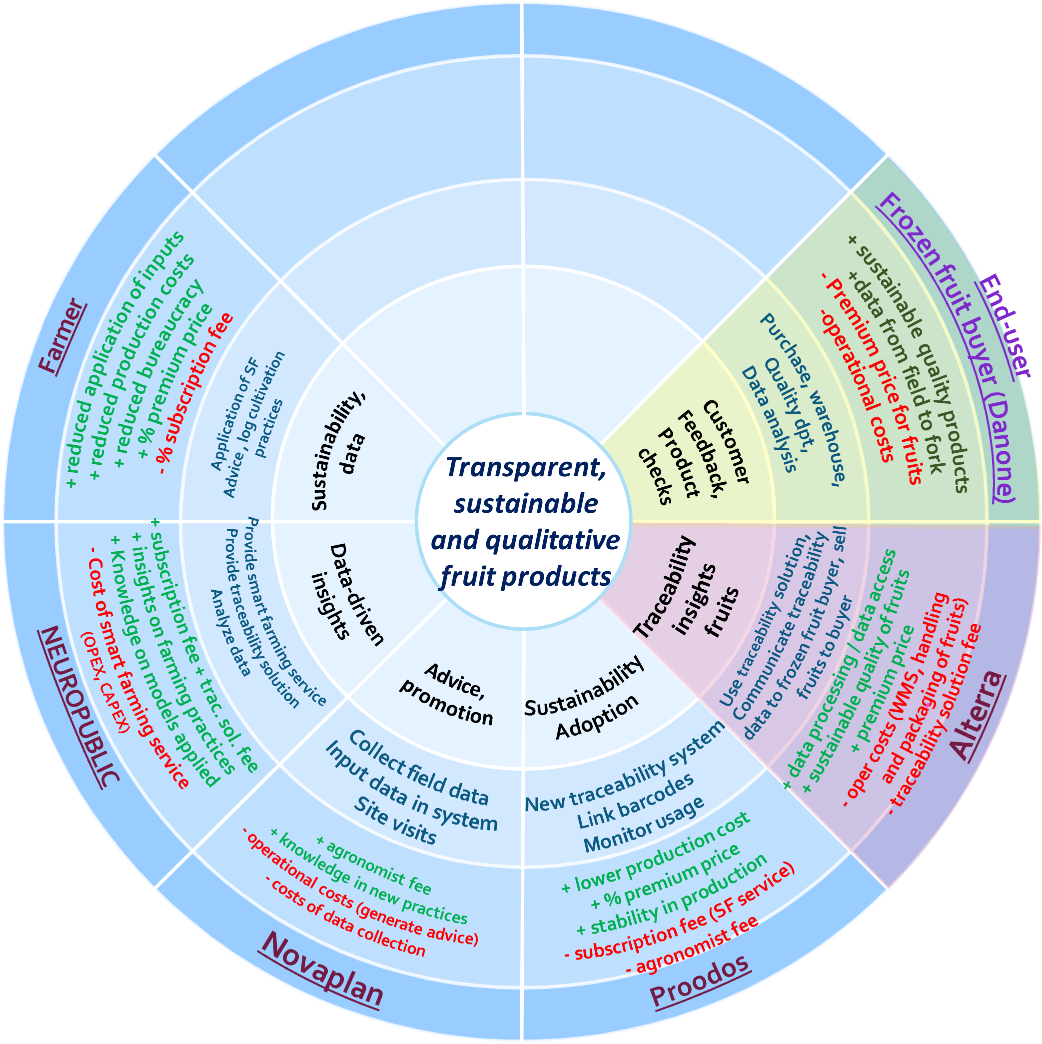

Figure 3 - Business model design for SIP1

The pilot outcomes are expected to yield various benefits, including reduced input requirements, assistance in obtaining certifications, a streamlined and more accurate production process, and enhanced visibility. As the business model scales, compliance with sustainability regulations, precise production prediction and quality, and a comprehensive service encompassing the smart farming solution are anticipated. Alterra will expand its team to handle the increased data load, and certification processes will be further automated. Ultimately, this initiative aims to foster strong consumer trust in the sustainability of fruit products.

3.1.4 Strategic implications and challenges faced

The proposed solution largely depends on ensuring that the cultivation and production process for the crops can be made transparent, as this is central to the value proposition and value capture mechanisms for the farmer. The challenge here is to ensure that this data at *all* farmers can be collected and distributed across supply chain actors towards the end consumer, considering the various sources that are available (observations and analyses of agronomists, weather data, sensors in the field, (digital) farm calendars) to produce such an advice. This places emphasis on the role of the farmer to comply with the logging practices posed by the smart farming service as well as to use the advice generated by the smart farming service to achieve a more sustainable production of fruits.

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This challenge is twofold: it requires on the one hand to motivate using the service in general (i.e. to start the collection of data to support the generation of farming advice), as well as motivating farmers to use the service as intended (comply with the required logging practices). Since the smart farming service generally services a set of (neighbouring) farmers, community-based initiatives to motivate farmers to do so may be explored here. SIP1 indicates that farmers already share knowledge amongst peers on their farming practices to better understand why certain results in terms of quality and quantity of yield were received. As data is actively collected as part of the smart farming service, this data can help in supporting these knowledge sharing processes.

Additionally, in terms of distributing the revenue generated through higher quality produce, the distribution scheme should be clarified (what percentage of revenue is given to which farmer, and how will the associated contracts in the long-run be managed?). Logically, Alterra will benefit through being able to sell (the value of) sustainable products at a premium, which should be remunerated over the farmers that have provided produce for these products. Here, it is important to explore how this distribution will be facilitated and under what conditions this will take place, such that a fair but also sustainable remuneration is achieved. Additionally, it should also be explored how Alterra and Proodos cope with differences in expected yield over time. For example, can farmers always sell all their produce to Alterra or is this capped based on the contracts that Alterra engages for with frozen fruit buyers? How can we establish flexible yet mutually beneficial contracts to facilitate this?

3.1.5 Next steps

SIP 1 will focus on stimulating adoption of the digital innovation by farmers, by stimulating trust through formal (formalized agreements with farmers) and informal mechanisms (relationship management) for the solution offered and to work with the farmers to improve the usefulness and user experience for the farmers involved. In addition, they also will investigate the certification of the smart farming solution such that it enables the value chain to connect to different markets (i.e. provide sustainable value propositions) as well as enables SIP 1 to access subsidy to further support their operations.

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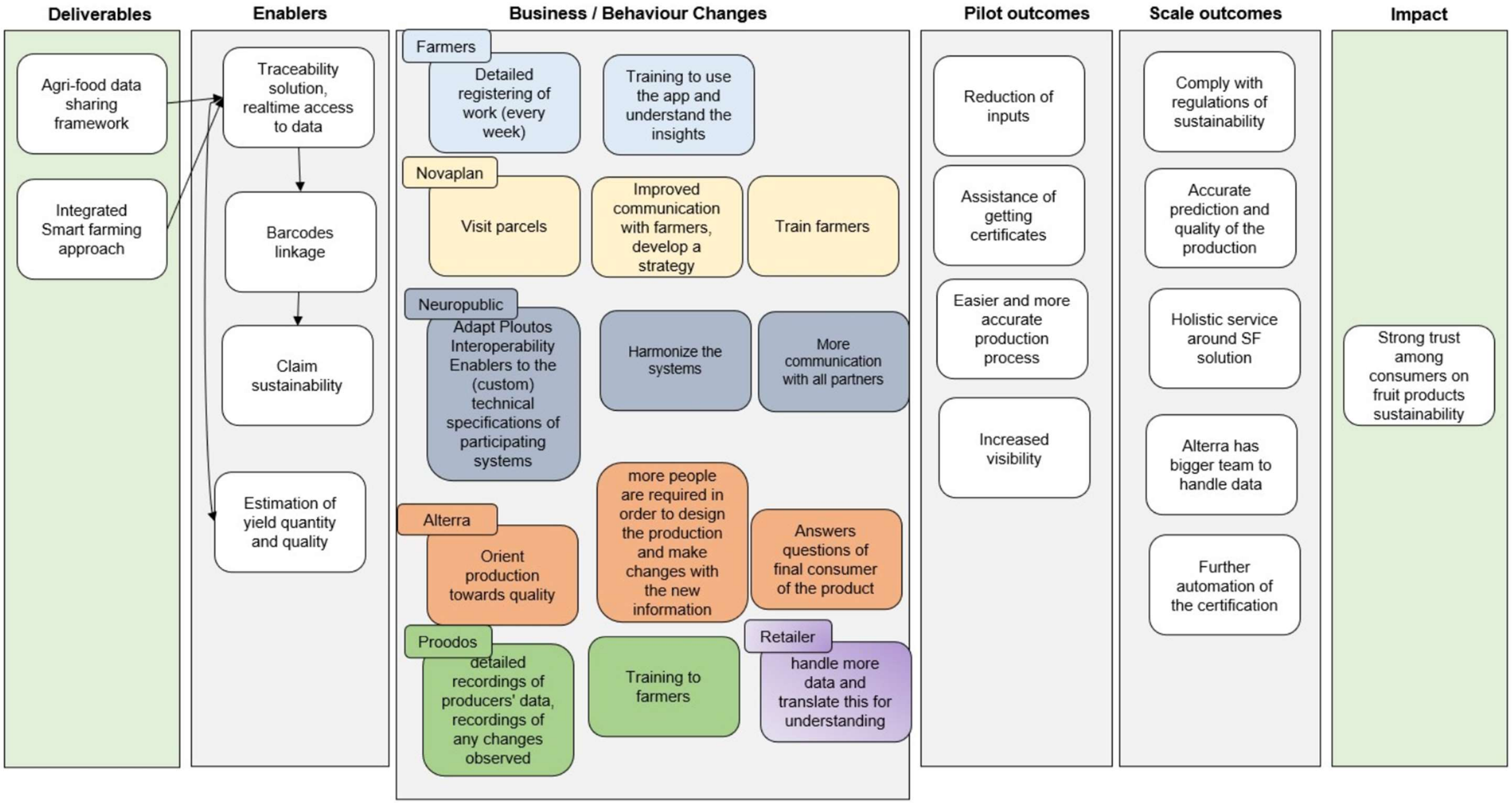

Figure 4 - Impact logic for SIP1

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3.2 SIP 2 – Wheatsurance

3.2.1 Solution and value proposition

SIP 2 focuses on providing a DSS-based solution to *durum wheat farmers in Italy*: through this solution, they are able to receive advice on their farming operations, their field and how to deal with plant protection. This can help them generate insights on their production performance and how they can *sustainably* improve their performance. To generate these insights and advice, farmers are required to periodically enter data on their farming activities for the DSS. This data serves as input for model-based analysis in the DSS on the basis of which farming advice is given. A variety of benefits can be considered as a result of this: farmers are able to reduce the use of fertilizer and pesticides, which contributes to decreased CO_2 emissions, higher product quality and production as well as overall insights or control over their farming practices.

The DSS-based solution is coupled to a parametric insurance service that provides *financial protection* to farmers in case of adverse weather conditions. This means that farmers are compensated for decreased yield *if* farmers have adopted the advice *and if* the DSS models would have predicted a different yield to occur (meaning that external factors such as poor weather have caused a delta in actual yield). The advantage of this insurance service over regular insurance services is the fact that through parametric models an *increased speed* of payment can be achieved, which in turn benefits the farmer through *decreased risk*.

In this SIP, the farmers are the *end-user* of the solution package rather than the customer (e.g. responsible for purchasing the solution). Barilla, a large pasta producer in Italy, is considered as the customer and intends to purchase the solution and provide this to its farmers. Barilla intends to do this to strengthen its relationships to its farmers, which are responsible for its supply of durum wheat. Logically, if through use of the DSS its farmers are able to better manage their farming practices, this benefits Barilla through increased predictability of durum wheat supply. It also intends to reward its farmers for better product quality through reshaping long-term contracts. DSS access enables farmers also to access parametric insurance services – this is stimulated by Barilla, but not compensated (i.e. farmers themselves pay insurance contracts).

3.2.2 Business model design

The business model design which emerged through the SCBMI approach for SIP 2 is illustrated in Figure 5. The central value-in-use offered by means of the 'package of solutions' is *sustainably and farmer friendly production of high-quality grains*. The customer of the business model design is **Barilla**, which intends to purchase the solution package to strengthen its (relationships with) farmers. Through provisioning of the service, Barilla is able to benefit from the following costs and benefits:

- Sustainable image
- Increased product quality (durum wheat)
- Increased predictability of demand
- Supply chain strength / better customer relationships
- Service fee paid to Horta to access the DSS for its farmers
- Operational costs related to contracting for farmers
- Premium prices for farmers in case of better product quality

For the farmer as end-user, the following costs and benefits are obtained:

- Security of income through financial protection and improved contracts

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- Reduction of resources (fertilizer, pesticides) needed
- Premium prices paid by Barilla for better product quality
- Increased control over farming practices
- Need to comply with advice given by DSS
- Use of the DSS – effort made to input data
- Insurance fee to access parametric insurance service

One can see that for the farmer, attention should be paid to how the DSS is used in terms of costs that can be occurred. Additionally, the parametric insurance service is currently paid by farmers – it could be opted to further support farmers if Barilla also helps farmers in supporting their insurance services.

The solution is offered by **Horta** which acts as the orchestrator / service provider of the business model design. As orchestrator, Horta:

- Enables insurers to provide their services through the DSS platform
- Collaborates with farmer's associations to support the use of the DSS service
- Collaborates with CETIF to connect insurers to platform / enables CETIF to connect its platform interface for insurers

For doing so, Horta generates benefits related to the service fee paid by Barilla to access the DSS as well as a connection fee (shared with CETIF) for enabling insurers to access the DSS platform. As costs, Horta is required to operate and maintain the DSS platform as well as is required to improve analysis models and conduct quality control.

The farmer's association (ConCer) is involved as a stakeholder to support the adoption of the DSS-based solution and drives the collection and sales of durum wheat produced at farmers to Barilla. Supporting the adoption includes clarifying to farmers how data is used as well as supporting the training of farmers to use the DSS as part of their services to farmers. Through business model participation, ConCer can capitalize on the sustainable image of its farmers. Additionally, since farmers gain more control over their farming practices, the predictability of supply increases. This can have various (sub)benefits for ConCer in terms of being able to negotiate better prices at Barilla or improving operational efficiency with regards to collecting durum wheat at farmers. In terms of costs, ConCer generates costs related to supporting the farmers. Additionally, costs of contracting (with Barilla) can be expected.

CETIF supports the networking and integration of insurers for the DSS based solution. It also provides the models for the parametric insurance service. For connecting insurers to the Horta platform, CETIF receives a connection fee (shared with Horta). In addition to this, a service fee can be expected in case insurers do not have a programmatic interface by which they are able to offer their insurance packages to the DSS. Additionally, CETIF benefits from participation in terms of visibility as an insurance service provider as well as generates knowledge on the validity of the parametric insurance models. For CETIF, operational costs are expected to connect insurers to the Horta platform, whereas development costs for the parametric models used are expected.

Insurer(s) are responsible for offering *timely financial protection*. They benefit for the business model design through expanding their portfolio and increasing the efficiency of handling insurance claims (which through the data collected for the DSS can be largely automated). The insurer(s) logically pay out to farmers in case (valid) claims occur and pay a connection fee to CETIF / Horta for connecting insurers to the platform (particularly if insurers lack a platform-based interface, in which case an additional service fee is paid to CETIF). Operational costs related to handling insurance claims / setting up contracts can be expected.

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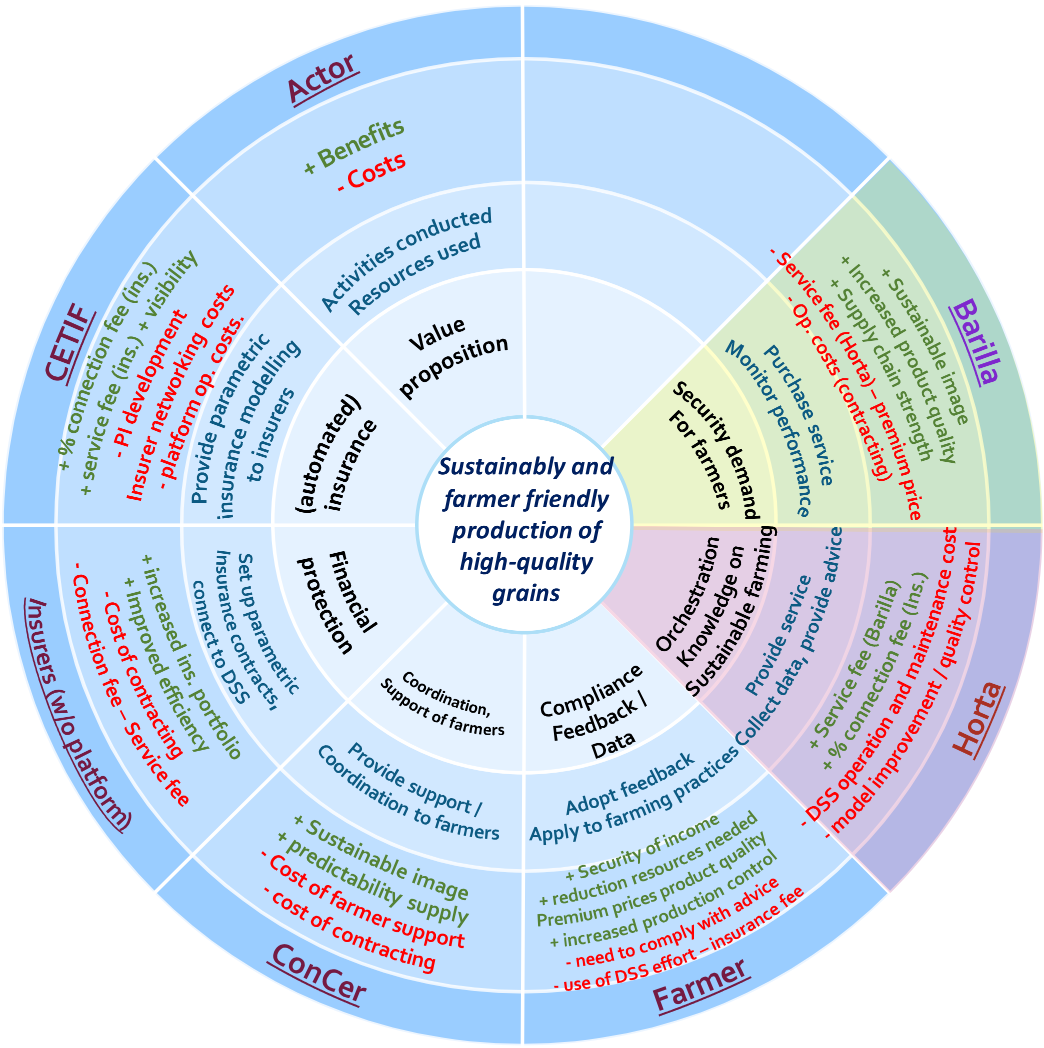

Figure 5 - Business model design for SIP 2

3.2.3 Impact logic

Based on the business model design, the impact logic for SIP 2 was drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 6. The deliverables for SIP 2 (DSS-based service and parametric insurance service) enable farmers to receive insights and advice on their farming (crop) performance (field conditions, operations, use of resources) and enable farmers to reduce their risk / automate payment for insurance claims in case of adverse weather conditions (meaning that if the model is followed but the yield is less than expected, compensation should occur). In the following, we first elaborate on the DSS-based service, after which the parametric insurance is discussed.

To generate the advice, first access to the DSS should be given. This is conducted by Barilla which purchases the license to use the DSS from Horta and consequently presents this to the farmer. To do so however, the farmer and Barilla should contractually engage in how the DSS is to be used. This relates on the one hand to the renegotiation on contracts to support premium prices for premium quality durum wheat, but also concerns the length for which farmers use the DSS. Use of the DSS is asked from farmers: here, farmers do receive support (by ConCer and Horta) on how the DSS is to be used to stimulate its adoption.

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Farmers are required to input data to the DSS to ultimately receive advice. This means that farmers periodically input data on crop conditions / farmland conditions to the DSS. This data is complemented by data collected by Horta, related to weather and soil conditions as well as information on the type of wheat under consideration. Both data sources are then used and analyzed to generate advice on the farming practices of the individual farmer. The farmer adopts this sustainable farming advice to contribute to operational efficiency: through the advice, it is able to reduce fertilizer and pesticide use. Farmers have degrees of flexibility in terms of using the advice given. It is indicated that Barilla does not control these actions. However, to benefit from insurance services, it strongly advised to follow up on the advice presented by Horta *as much as possible*: Horta does indicate what advice is preferred to follow up and what advice is required to be followed up, supporting the farmer in its decision making.

Through use of the DSS-based service, the farmer is expected to reduce its resources needed (fertilization, water, pesticides) which translates into financial savings long-term. This also contributes to reductions of CO_2 emissions over time. Additionally, the advice can improve the quality of the produce ultimately yielded, which enables farmers to access higher prices through the contracts established with Barilla. Farmers however may find that the DSS use can result in the perception of being 'controlled', particularly if it is not clear how data is being shared by Horta or how Barilla uses the DSS in the future to drive decision making based on plant quality (i.e., if some farmers do not achieve a certain quality whereas others do, they are penalized).

For the parametric insurance, which enables automated payments in case of (unexpected) loss of yield, contracts have to be defined between selected insurers and farmers. For this solution, only those insurers are available which already collaborate with Barilla (dedicated partner of Barilla). As indicated, it is not expected that Barilla will act as the beneficiary for farmers in light of the insurance contract – farmers themselves have the option to purchase the insurance service but are required to pay for it themselves. It is indicated by stakeholders that contract definition is still being explored: short (1 year) and long-term (3 year) contract are considered as well as contracts which apply for a group of farmers.

As explained, if the actual yield is lower than the predicted yield *and* the farmer followed up on the advice, the parametric insurance triggers and compensates the farmer for the difference: the price for this is set as part of the contract and matches the price paid by Barilla. As a result, the farmer is able to benefit from quicker insurance payments but logically is required to pay for the service. The novel connection between DSS and parametric insurance (PI) also enables the farmer to access different types of insurance services (which were previously not possible as data-driven support was absent).

Horta intends to scale its solution to all farmers involved for Barilla, which are active in Italy and Greece. To do so, Horta is required to scale its internal operations: for example, weather stations should be installed to support additional farmers in different (geographical) locations.

For CETIF, there is need to investigate how PI can be applied for different geographical areas: depending on soil and climate conditions, different risk profiles may have to be identified (requiring farmers to pay a higher / lower insurance fee).

For Barilla, the scaled business model design contributes to strengthening its farmers, which in turn helps Barilla in terms of supply chain strength. For Horta, the efforts of the SIP contribute towards its goal of supporting sustainability at farmers. For insurers, participating in this business model design helps in connecting to different farmers and to provide (data-driven) insurance products.

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3.2.4 Strategic implications

The business model design has several strategic implications as well as still has some business challenges. For Horta, this business model requires strategic repositioning from a traditional technology provider perspective towards a (platform-based) service provider, integrating the services of concurrent actors for their DSS / Horta platform. This enables Horta to provide more holistic services to farmers, but also requires Horta to develop orchestration capabilities to be able to integrate different services of different providers.

For CETIF, the business model design also calls for strategic repositioning: the parametric service may call for platform-based service through which the service can be accessed, particularly if insurers lack these capabilities. In such cases, CETIF will act as a *service provider* rather than a knowledge provider. In this knowledge provider setting, they would only provide insights on how the insurance models work or can be applied in practice. After this exchange of knowledge, insurers would then be able to support their own insurance practices. However, through providing parametric based services as part of the Horta platform, CETIF can now add additional value by also enabling insurers (supporting automation, delivery) to provide their services. This requires CETIF to organize how these services will be offered, as well as calls for long-term support on operating and maintaining such services.

For insurers, the prime motivation to pursue collaboration with the Horta platform is the fact that it opens up the opportunity to provide different insurance products. Data collected through the DSS enables insurers to offer specialized insurance services which previously (in traditional settings based on ad-hoc insurance claims) were not possible. The automated payment structure also can significantly reduce handling costs for insurers. This however should be considered in light of data privacy and sensitivity (to manage and use data of farmers appropriately and with consent).

Business challenges faced

In general, parametric insurance is a new concept and therefore immature in terms of adoption. Stakeholders for the SIP indicate that it is often difficult to explain both to Barilla as well as farmers *how* parametric insurance actually works. Although the benefits are recognized (faster payment), it is not clear what data is used why and how payments take place. The value of 'faster' payments more should be explored further. Despite the advantages, this can make farmers reluctant to adopt the service.

Even though Barilla intends to reward farmers for higher product quality and to restructure existing cooperation contracts with farmers, Barilla holds a position of power over its farmers (with ConCer as an intermediary). As farmers are required to present data to the DSS, they may generate the perception of control by Barilla: Barilla using data to analyze what farmers are underperforming and to penalize those farmers over time, or change payments or conditions over time. To mitigate this risk, ConCer should ensure that it is able to participate in such decision making at Barilla such that it can avoid such adverse decisions for its farmers.

3.2.5 Next steps

To support the further concretization of the business model, strategic decision making at Horta and CETIF should take place to commit resources towards deployment past the pilot phase. Therefore, the next steps for these organizations is to create internal commitment to commit resources and manpower towards the deployment and roll-out of the solution in practice. This involves communication of SIP stakeholders of business model results to their respective management.

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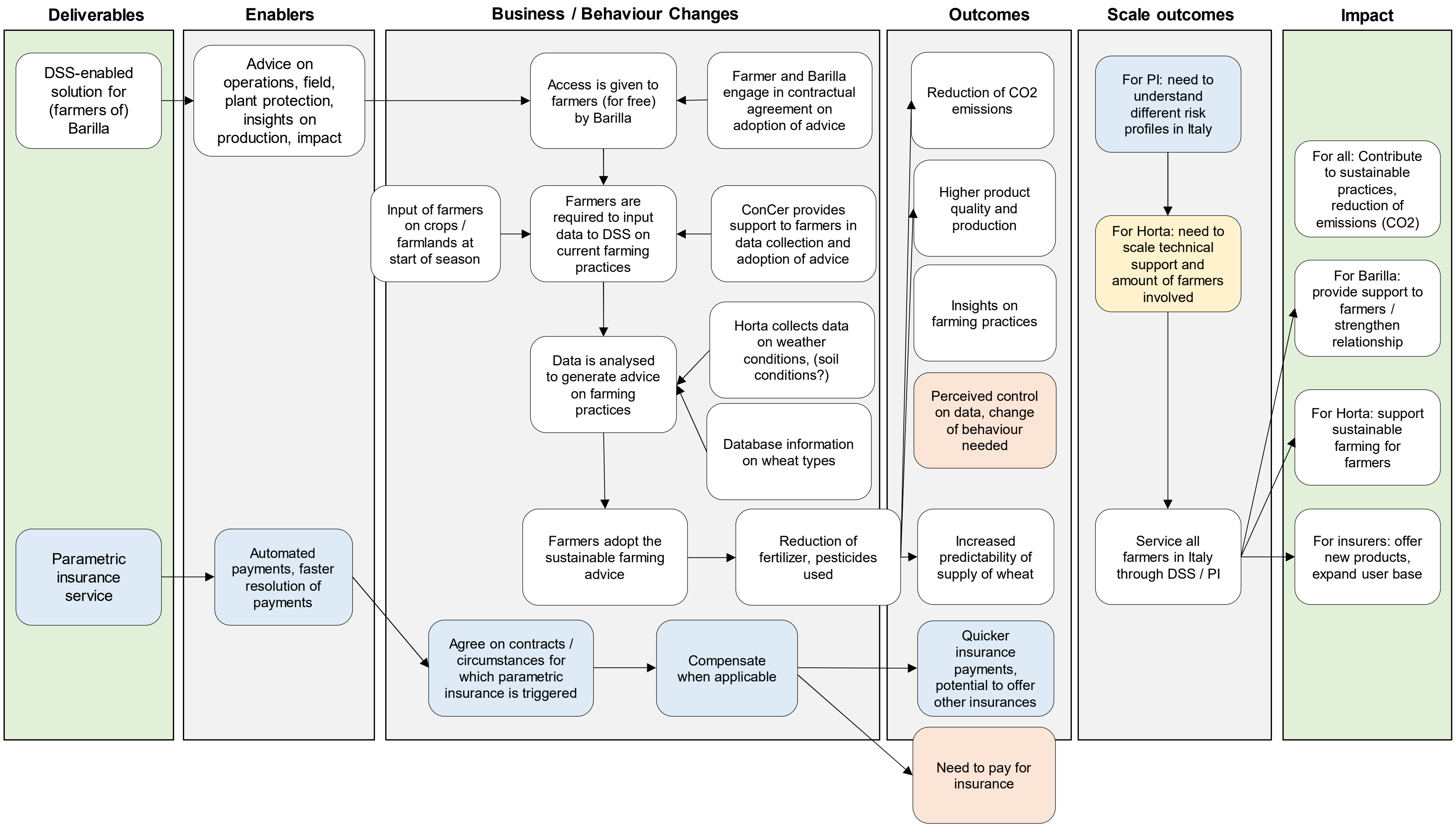

Figure 6 - Impact logic for SIP 2 (PI = parametric insurance, DSS = decision support system)

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3.3 SIP 3 – Consumer Empowerment

3.3.1 Solution and value proposition

SIP 3 focuses on providing a consumer platform-based solution to *communities of consumers* in various countries in Europe (such as France, Greece, the UK, and the Netherlands). Through this solution, communities of consumers can collectively decide on the specifications and characteristics of new products which they can consequently buy at associated retailers or supermarkets. These *customized* products are created by the value chain(s) involved for the solution. The consumer platform makes explicit what the implications are of incorporating or omitting certain characteristics from a product for the value chain needed involved for its production as well as the resulting price that is associated to it. For example, communities deciding on milk products can choose the type of food the cows receive, from its origin to whether it is modified or not. Logically, this calls for additional activities to be conducted in the value chain in order to facilitate this. These activities needed are reflected in the *recommended* product price in a transparent way, demonstrating how the recommended price is built up (including taxes, additional expenses) and how each value chain actor involved receives a part of this recommended price.

The value propositions of the consumer platform are twofold: on the one hand, it provides control back to the consumers over how products are developed, empowering the consumer in the process (rather than that the decision is made by leading producers in value chains). Consumers can decide on what products they would like to see available in supermarkets and what their characteristics should be. This enables (communities of) consumers to deliberately make choices that fit their preferences or needs. For example, consumers may drive the production of products that are sustainably produced (reduced CO_2 emissions) and/or may focus on creating products that ensure that (local) farmers are rewarded appropriately.

In addition, the consumer platform also creates value for value chains associated to the platform, particularly upstream actors within this value chain. The transparency offered per product provides insights on what costs are incurred by each value chain actor and consequently how the product purchase price is ‘divided’ over each value chain actor. Through this mechanism, a *fair remuneration* can be established and maintained, as it can be made explicit how many products are sold and as a result what each value chain actor therefore should earn (meaning that revenue cannot deliberately be consumed by lower stream actors (such as retailers), eating into the margins of upper stream actors such as farmers or producers).

3.3.2 Business model design

The business model design explored through the SCBMI approach for SIP is illustrated in Figure 7. The central value-in-use offered by means of the consumer platform-based solution is *empowering customers through transparent product customization*. The customer of the business model design is the **community of consumers,** a community that is empowered in their use of the solution to customize the products that they intend to buy. They can also drive product customization in such a way that it fits the motives or interests of the community itself. Through use of the consumer platform and through customizing products, the community of consumers are able to capture the following costs and benefits:

- Personalized products which fit the needs of the community at hand
- Social value created through fair remuneration of value chain actors responsible for the products

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- Environmental value created through driven the sustainable production of products
- Contributing to a fair price for products (knowing where your money goes)
- The recommended price that is paid for the product (note that this does not always necessarily result in a higher price for the consumer)
- Effort invested to grow the community to support the survivability of the solution

For products to be cost-efficient, there logically should be a sizeable community of consumers supporting the products. It is indicated that this occurs through (non-paid) promotion and advertising activities (for example using social media) to grow the community of consumers by its own community. These consumers are not rewarded or stimulated (financially) to do so, meaning that growing the platform and its products relies on the actions taken by consumers.

The solution (the consumer platform) is offered by **CQLP (France) / PETA (Greece),** responsible for maintaining and operating the consumer platform and orchestrating the working of the platform. This also involves ensuring that value chains are 'integrated' for the platform: integration in the sense that retailers are attracted at which the products are to be sold and that value chain actors are available to produce the products developed through the consumer platform. Through the associated retailers / supermarkets, communities of consumers consequently can purchase these products.

CQLP/ PETA intends to break-even – any profit generated is used in different projects such as the launch of the platform in different countries or extending launches locally or creating funds to support (local) charities. For supporting the activities on the consumer platform, CQLP / PETA receives a percentage of the recommended price for which products are sold. To operate and maintain the platform, operation and maintenance costs are occurred.

The remainder of the business network constitutes of the value chain(s) responsible for producing the customized products as well as NEUROPUBLIC which contributes towards making production processes even more insightful (through facilitating data share). For the value chain actors, we differentiate between the retailer, farmer and others (e.g. packagers, distributors).

The retailer serves as the down stream actor from whom customized products can be bought. The value proposition of the retailer is to provide *availability*, but also to provide *trust* in the sense that the recommended product price is evenly distributed over the remaining value chain actors (including the farmer). Discussions on margins that are captured by the retailer and the value chain are left to the actors themselves – no involvement of CQLP / PETA exists in these discussions (the initiative only offers a recommended price and estimates on margins). Through participation, the retailer is able to benefit from increased product offerings (as part of *la marque du consommateur*), contribute towards fair remuneration of farmers as well as a receive a (fair) share of the product price. In return, it incurs costs related to stocking and selling the respective products.

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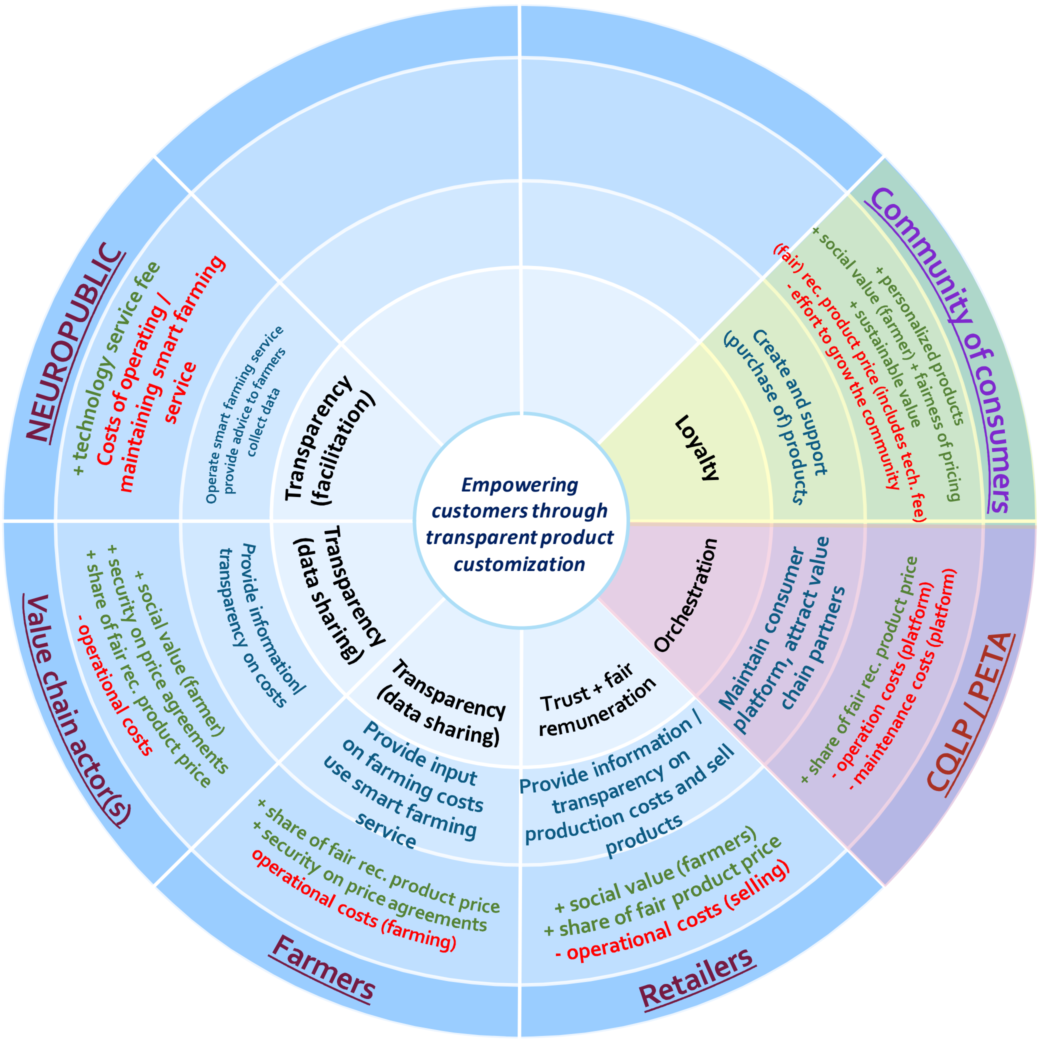

Figure 7 - Business model design for SIP3

The farmer, like the other value chain actors, has to make explicit what activities is conducts to support the production process of customized products, what the costs for doing so and what this implies for the share of the product price the farmer intends to / should receive. This can be partially supported through the Gaiasense solution, collecting data on farming practices. Using Gaiasense can also contribute towards efficiency on farming practices, which can benefit the farmer in terms of reduced resources (water, fertilizers, pesticides) needed as well as increases in overall farming efficiency and quality of output. Through participation in the business model design and through the transparency achieved, the farmer benefits from security on price agreements (value chain actors are rewarded based on their efforts). As a result, the farmer receives a fair share for the products it produces. The technology fee required to use the smart farming service is intended to be covered as part of the recommended price paid for the products (meaning that the costs of the smart farming service are calculated in the product price). This means that the farmer is not burdened with investing for the smart farming service. The farmer however does incur operational costs related to farming activities to produce the customized products requested.

Other value chain actors are included to complement the activities needed to produce the products requested by the communities. As explained, these actors can include packagers, distributors or other intermediaries needed. Similar to the farmer, these actors need to make explicit what value adding activities they conduct to produce the products on the shelves at retailers and what costs are

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associated to this. Based on this, a fair price can be remunerated. Accordingly, the value proposition of these actors is *transparency*. Through participation in the business model design, these actors benefit from *social value* that is created (fair remuneration, particularly for farmers) as well as have security on what share of the product price they will receive. Logically, this share of the product price serves as a financial benefit for these actors. In terms of costs, value chain actors occur operational costs related to the activities they undertake to produce the products.

NEUROPUBLIC's contribution is twofold: on the one hand, it supports farmers through smart farming services, enabling farmers to increase their operational efficiency in a sustainable way. On the other hand, it collects data for the value chain which allows value chain actors to strengthen the claims made regarding fair remuneration. For participation in the business model design, NEUROPUBLIC receives a technology fee (from farmers) for providing the smart farming service, but logically incurs costs related to maintaining and operating the smart farming service at farmers.

3.3.3 Impact logic

Based on the business model design, the impact logic for SIP 3 was drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 8. The deliverables for SIP 3 (consumer based platform) is aimed at (communities of) consumers that empower such consumers to define and customize the products that fit their needs and preferences. Customizations options are offered through the platform to accommodate this, for which it is explicitly indicated what impact this has for value chain actors involved.

To support the consumer platform, value chains first have to be associated to the platform such that products (and their respective customizations) can be offered and selected. Moreso, agreements should be established with retailers such that the products can be stocked and ultimately can be purchased. This is an interplay between the value chain and the retailer. Logically, this depends on what type of product is considered as well as the expected demand for the product (as the products customized through the platform compete with other products for shelf space). Again, CQLP does not negotiate with retailers on the actual product price. It is however inferred by the transparency on costs and margins explicated for the value chain (hence, a recommended price is offered). This decomposition of the recommended price is presented in such a way that it protects information on the margins of parties involved (as to not discourage retailers or value chains to participate or to provide sensitive information).

Once value chain actors and retailers are associated to the platform, information should be collected on the activities to be conducted (and customizations associated to this), the costs related to these activities and the margins (in terms of share of product price) to be obtained. Through this, CQLP/PETA is able to enable product customization through the consumer platform. It should be noted here that particularly the costs associated to activities are a ‘snapshot’: it does not dynamically account for shifts in energy, resource, or labor prices. As a consequence, the recommended price should periodically be adapted to reflect changes in production costs (which in light of current energy and material crises is an important challenge to consider). Currently, SIP3 is exploring how best to approach setting the recommended price for products being developed.

Once available, communities of consumers can start to customize products based on their preferences. Here, customer surveys are used to support this process. Once the product is defined, the value chain starts production based on the product specification. This information is forwarded by CQLP to relevant value chain partners, which commence the production of the products and shipping it to the associated retailers involved. As explained, the production process (and collection of data) is

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supported through the Gaiasense smart farming solution and can help in increasing the efficiency for farmers. Once produced, the products are stocked at retailers after which they can be purchased by the community. A (fair) price is paid (based on the recommended price through the consumer survey) which is remunerated by the retailer to all involved value chain actors (each actor receives its fair share of the price, based on the margins agreed upon, including a partial share for CQLP/PETA to compensate the platform costs).

As a result of the pilot, improved farming efficiency is expected to be achieved through use of the smart farming solution. Additionally, a fair remuneration and price assurance is achieved for value chain actors involved. For communities of consumers (depending on their preferences), both social as well as environmental value can be created. For the retailer, the main value lies in expanding its product base, which can help in attracting additional customers. Logically, a cost is the fact that in order for the customer platform to work, information *has* to be shared on production activities, costs and margins. Although current perceptions are not negative towards sharing this data, it can create difficulties in the face of competition (as it becomes explicit how product margins are shared).

In terms of scaling, CQLP/PETA aims to expand the brand across Europe to support fair remuneration for farmers. To do so, both scaling at the platform level as well as country level needs to be achieved. For the former, scaling is predominantly dependent on the intrinsic motivation of communities of consumers to attract additional consumers / enlarge the community. This task is not financially supported through CQLP/PETA, meaning that communities should intrinsically drive this scaling ambition. In addition to the scaling of communities, it is also the task to scale the products and value chains that are to be associated. This also requires efforts by CQLP/PETA to ensure that this is facilitated and to talk and collaborate with retailers to shelve new products. In terms of cross-country scaling, the learnings of the solution implementation are taking into account and are used to source interested parties in other countries. For parties to be applicable, they should share the values of CQLP and have starting capital to kickstart implementation of the solution. CQLP/PETA does not financially support the startup of brands in different countries but does provide (knowledge) support in terms of advertisement, marketing campaigns. New members are also not required to pay a license fee until a certain financial threshold is reached. Through scaling of the solution, farmers can benefit from fair remuneration, whereas CQLP/PETA is able to achieve its goals to support this. For NEUROPUBLIC, adoption of the smart farming service in different countries (supporting environmental and farmer related challenges) also relates to its goals.

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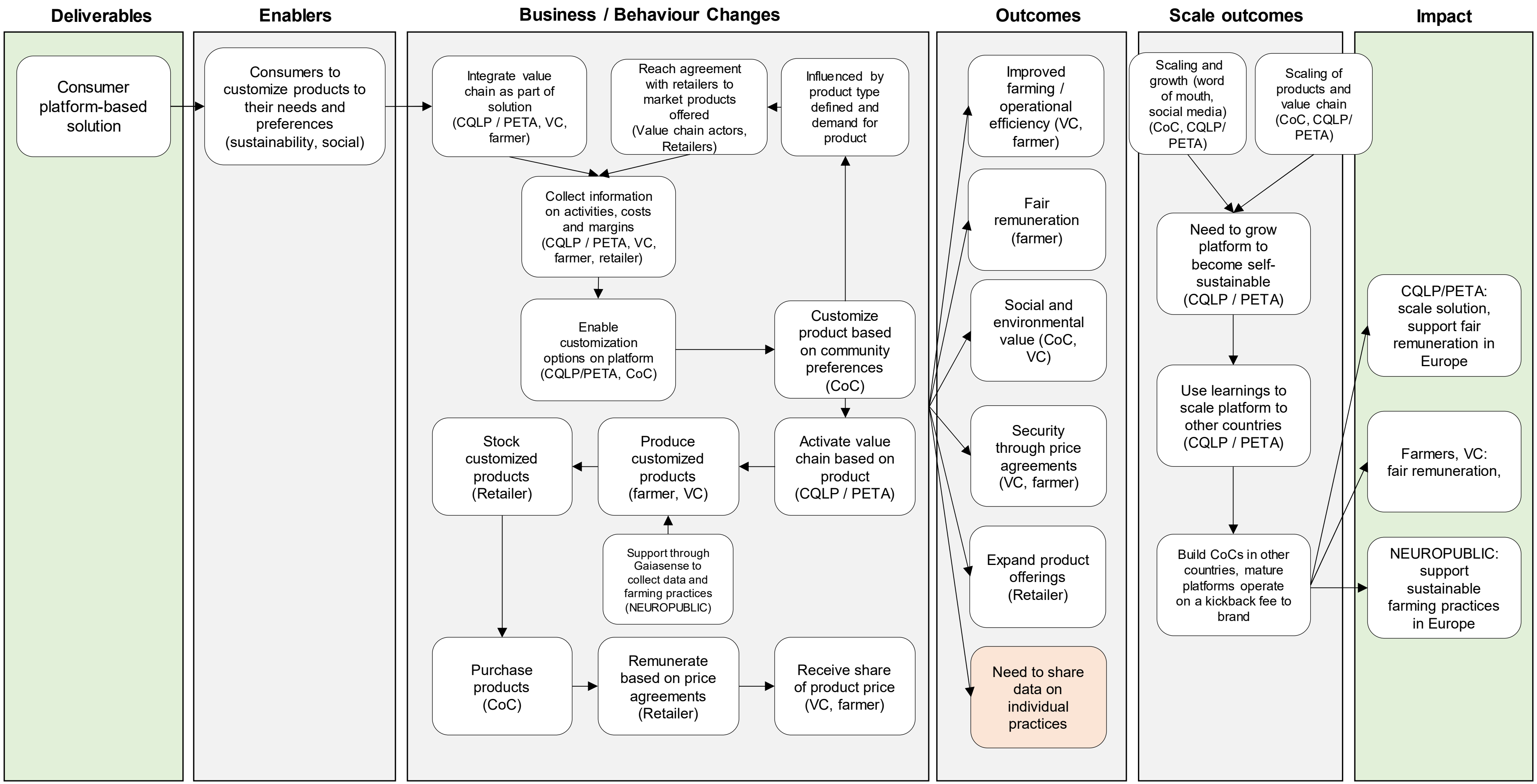

Figure 8 - Impact logic for SIP 3

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3.3.4 Strategic implications and challenges faced

The strategic intent for value chains to participate in this business model is to ensure that actors are fairly remunerated. This can also contribute to intensified collaboration between value chain actors. However, it does imply that some kind of openness of activities (transparency) should be provided to do so. Value chain actors should therefore consider whether it strategically makes sense to do so (particularly in more competitive settings).

A similar case can be considered for retailers: if product prices of similar products are significantly higher than those produced through CQLP/PETA, this can indicate that either the retailer or the brand offering the product captures significant margins (as the products through CQLP/PETA are transparent in how the price is formed). This may be undesirable in wake of competition for either the brand or the retailer, and can result in popular brands exerting pressure.

Business challenges faced

As the product price serves as a snapshot of costs incurred by value chain actors, it is difficult to account for changes in the market. Rolling out multiple customer surveys to account for this is not an option on a very short-term basis, as for example the packaging incorporates the product price. This would imply that new packages have to be defined on a rapid basis, which is not feasible. Currently, 3 year contracts on recommended prices are considered and voted for (also to ensure that the production takes place over a longer time and to provide guarantees to farmers) but different ways of dealing with this challenge (to ensure fair remuneration) should be explored.

A business challenge also relates to scaling the communities to sustain platform operations and to attract value chains to participate. Without sufficient demand but also supply, it is difficult to attract retailers and can therefore make it impossible to generate return on investments (through product sales). Currently, scaling of the platform depends on the intrinsic motivation of consumers. Referral schemes can be considered to help in (externally) motivating communities to grow and to ensure that multiple products are defined and sold, but the financing or working of such schemes need to be further explored.

3.3.5 Ad-hoc support: exploring consumer empowerment

In addition to the definition and discussion on the business model design for SIP 3, a need was expressed to investigate the consumer empowerment plan journey as part of the ad-hoc part of the SCBMI process. Through an additional workshop with the SIP 3 stakeholders, this plan as illustrated in Figure 9 was drafted.

The journey begins with a trigger, which occurs through various ‘public relations’ (PR) efforts such as social media campaigns, outreach in schools or universities, presence in supermarkets, engagement with initiative ambassadors, participation in UN or EU campaigns, and even encounters in coffeeshops. The aim of these triggers is to spark interest and encourage potential customers to engage with the brand, primarily through social media interactions.

The initial interaction with customers typically takes place through their participation in (online) events, which serve as an introduction to the initiative, its products, and the voting tool. The website and newsletter are the primary channels through which customers engage during this stage. Additionally, the in-store experience allows customers to discover the products available at local stores and facilitates information sharing with the store and fellow consumers through the mobile

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app. Within the app, customers can identify products, provide feedback, and even request specific items.

As the journey progresses, customers may evolve into ambassadors for the initiative. Through in-store events, they have the opportunity to interact with other ambassadors and can choose to become members of the cooperative/association. They can take on the role of ambassadors themselves, participating in in-store events and encouraging other consumers to join the initiative.

3.3.6 Next step

As a next step, SIP 3 will focus on exploring the retailer retention for the platform. As also indicated by the strategic challenges, retailers face pressure by the market to offer certain products or to comply with shareholder interests in terms of margins attained. The problem also exists that in case the strategic direction of retailers' changes (for example a new board is installed with different interests on how the retailer should operate), this may result in retailers leaving the platform. Since the platform is dependent on its sales channels for the solution to work, it is imperative that retailers are retained for the platform. Therefore, SIP 3 will investigate how this retention of retailers can be fostered. This involves a detailed analysis of the motivations to participate for the consumer platform, such that the objectives of the retailers can be aligned with the intentions of the platform. Moreso, the risks and challenges that maybe faced throughout the participation of retailers will be analyzed. On the basis of these risks and challenges, strategies will be developed to address or overcome these issues. These efforts contribute towards building long-term collaborations with retailers to support the use of the platform in practice.

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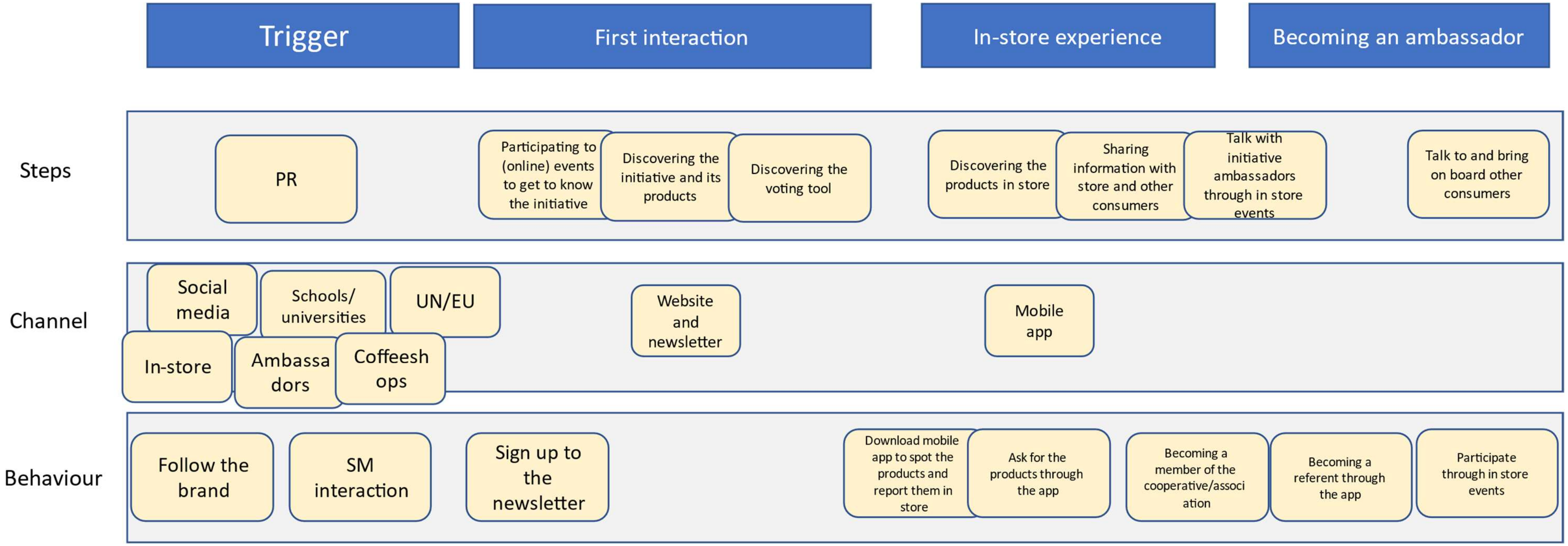

Figure 9 - Exploration of the customer journey for SIP 3

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3.4 SIP 4 – Sustainable Greenhouse Production

3.4.1 Solution and value proposition

This SIP focuses on the greenhouse horticulture value chain in Spain addressing the traceability disconnection between preharvest and postharvest and lack of integrated data control across the value chain (productivity, environmental, social data).

Currently, there is a link between pre- and post-harvest, but it is based on manual and paper records and with very limited data. In the context of SIP4, more data can be gathered using IoT and therefore traceability data can be generated with minimal cost and above all avoiding human error caused by manual recording.

This SIP pilots the implementation of sensors within the greenhouses, which allow implementing Smart Farming and Industry 4.0 processes. This contributes to improved productivity, reduced costs, less environmental harm and more traceability data with minimal cost and minimal human errors.

The smart farming solution central for this SIP is introduced at greenhouse farmers (growers) that are associated to the Unica Group: a second-degree cooperative of farmers. Hispatec provides technical advice and data-driven insights to UNICA Group. Sensors are be placed at the greenhouses of participating farmers, measuring data such as soil quality, temperature, moisture, conductivity and soil temperature data. This plays a significant role during the pre-planting, and growing phase of the crops. Part of the solution involves sharing data and best practices that are gathered at different growers within the pilot. By doing this the grower can produce more sustainably and transparently and the data from different farmers can be compared to discover the most efficient way of producing, thus saving costs and increasing revenue.

Hispatec provides technical advice and data-driven insights to Unica Group. Unica uses the data to produce tailor-made advice to the growers. This advice can serve as input for farmers and farming machinery to support sustainable farming practices. The products that are produced in this fashion, can be sold for a premium price to the retailer if growers undergo a certification procedure because they have been produced in a sustainable and transparent way. The retailer can sell the product for a higher price because the quality increases and sustainable products can be sold for a premium. The retailer will also have more certainty about the amount and quality of the produce, which increases predictability and reduces costs for the retailer. A certifier checks that the product has been produced in a sustainable and transparent way, such the premium price can be paid for the product. Likewise, being able to guarantee retailers a complete traceability from the greenhouse to retail point (also in environmental matters) increases the interest of retailers for said product, even if they do not have a certificate – this can warrant better contracts (in terms of prices received) or more loyalty in terms of contract durations (long-term collaborations).

In this SIP, the growers are the customer of the solution, UNICA is considered as the orchestrator, providing its service to the associated growers.

3.4.2 Business model design

The business model design for SIP 4 is illustrated in Figure 10. The central value-in-use is *Transparent & sustainable farming operations,* which is the result of using the smart farming service and through decision making based on the insights generated.

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The customer of the business model is the **grower**, which will use the sensors to increase efficiency and will be able to reduce inputs and resources used. By using the solution offered, the grower is able to obtain the following benefits and costs:

- Reduction in resources and inputs used
- Increased efficiency
    - Increased output (quantity + quality)
    - Decreased use of fertilisers and water
    - Increased soil conditions
- Data sharing with Unica which costs time and autonomy
- Investments in sensors

UNICA Group is the orchestrator in this business model, meaning that they are the central actor in this model. They offer sustainable farming as a *service* to its growers. In this role, Unica:

- Is the main point of contact for the other actors in the business model
- Negotiates with retailers on (premium) price for the products farmers produce. It also collects the price for the products which the sell on behalf of all their farmers
- Provides advice to farmers on the sensors, data and other technical issues
- Monitors data from farmers and the usage of the sensors by farmers
- Receives advice from Hispatec on sensors and data analysis
- Collaborates with certifiers to validate the results

For doing so, Unica receives a premium price from the retailer for the products the farmers produce. From this premium price, a technology fee (license fee) for Hispatec is paid. The remaining sum will be paid to the farmer.

Hispatec is involved to support the implementation of the solution at the greenhouses. It provides advice to Unica on which sensors to use and technical / IT issues that arise from the usage. It also installs and maintains the sensors and IT system when needed. Additionally, Hispatec can train farmers on how to use the sensors and how to obtain data. This data currently is integrated and stored at the Cloud System of Unica (Unica owns the data). The collected data is subsequently analysed by means of different statistical approached by Hispatec. After that, the data is presented at a dashboard by Unica and subsequently, the data is presented to the farmer.

The **hardware provider** provides the sensors to farmers to ensure that the smart farming solution can be operated. Integration of the sensors currently needs to take place to support the operation of the solution. Therefore, the hardware provider is in close collaboration with Hispatec to ensure that the sensors are interoperable with the platform used and can collect and feed data to the smart farming service. Advice is given to growers through UNICA on what and how many sensors are needed to support their operations.

The **retailer** buys the product from UNICA and pays money for that product. The transparent production process ensures security of supply for the retailer, which allows them to plan further ahead with more certainty than with suppliers that don't have a transparent process (smart farming). The products that the retailer buys are also produced more sustainable than suppliers that don't use the proposed system. Sustainable products can be sold to consumers for a higher price and have a higher quality. For these advantages, the retailer pays a premium price to UNICA – compared to products that are grown conventionally.

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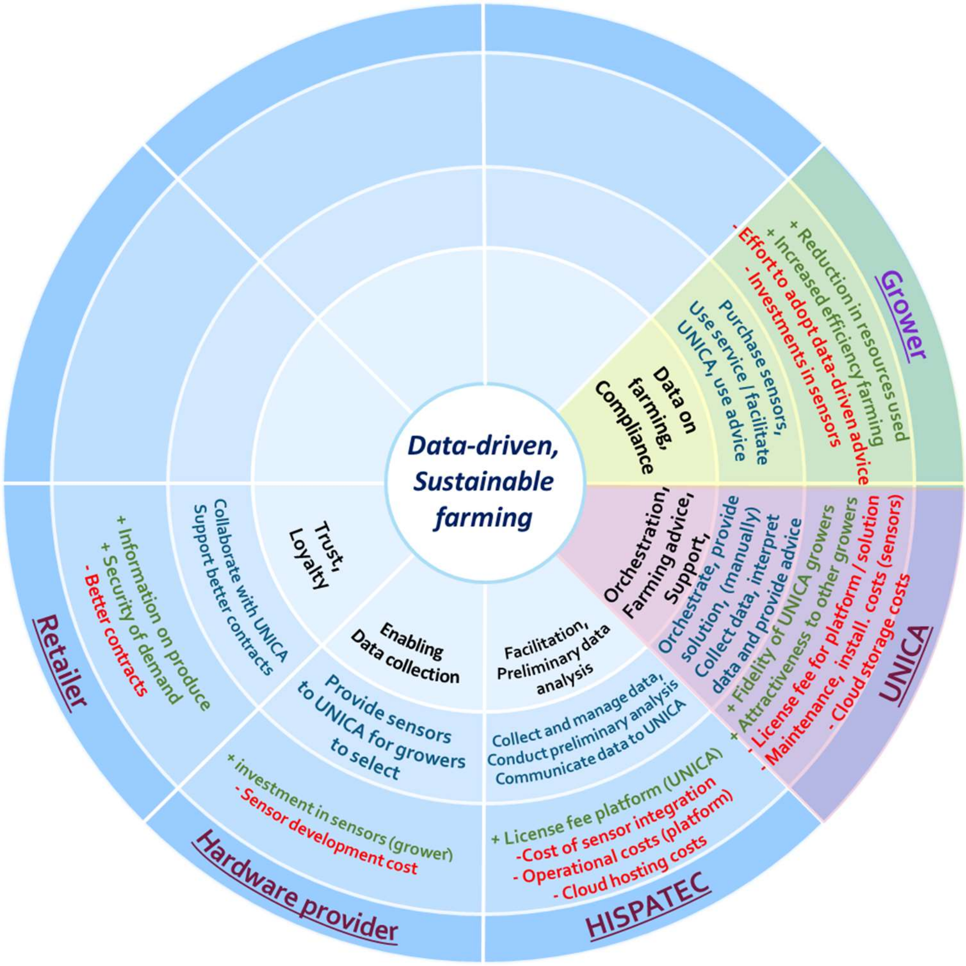

Figure 10 - Business model design for SIP 4

3.4.3 Impact logic

Based on the business model design, the impact logic for SIP 4 was drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 11. The deliverables for SIP 4 (In-Greenhouse sensors that allow for Smart Farming processes) enable farmers to receive insights and advice on their farming (crop) performance (soil temperature, electric conductivity, irrigation, moisture levels,) and enable farmers to produce transparent and more sustainable products.

As a first step in the Impact Logic, Hispatec advises UNICA on which sensors to buy. Unica then buys the sensors and they will then be installed in the greenhouses by Hispatec. Once the sensors have been installed, they automatically collect data and send it to a cloud-server that is owned by UNICA.

UNICA permits access to this data to Hispatec in order to analyse and interpret the data and provide insights on farming practices. These datapoints include soil temperature, moisture, electric conductivity and tensiometer data. Unica uses this data and combines the data from the sensors with other data (e.g. from their agronomists and from data-insights from other farms) to supply their farmers with advice on how to optimize their farming practices.

Farmers are required to adopt the advice given by Unica to be able to improve sustainable production methods. A certifier will validate whether farmer and Unica use the data-generated insights in their (farming) practices and thus make sure the products are produced sustainable. This means that

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production will lead to a reduction of CO_2 emissions, reduction of water usage and reduction of pesticides usage. It will also increase quantity and quality of output, a.o. by increasing soil conditions.

At the same time, the data sent to UNICA provides insight into the entire value chain and allows retailers to plan the expected supply for a longer time ahead. This increases the stability and predictability of their supply lines.

The outcomes are morefold: (1) Farmer output (both quantity and quality) increases because of improved soil conditions and farm practices, (2) Sustainability levels of farming and farm products increases because of reduced water, fertilizer and CO_2 loss, (3) data-based farming leads to more predictable supply chains and (4) Insights and learning possibilities from other farms that use sensors.

3.4.4 Ad-hoc support: Exploitation plan SIP 4

In addition to the definition and discussion on the business model design for SIP4, a need was expressed to investigate the exploitation plan as part of the ad-hoc part of the SCBMI process. Through an additional workshop with the SIP 4 stakeholders, the exploitation plan as illustrated in Figure 12 was drafted, which helped stakeholders to further delve into the actions to undertake to support the realization of the proposed innovations in practice. In the following, we describe both the actions defined up towards the end of the Ploutos project, as well as actions defined to further support the (realization and use of the) innovation in practice.

A clear challenge indicated by stakeholders from UNICA and HISPATEC is the fact that the implementation of the digital technology (i.e. the sensors and performance dashboards used) can often be difficult, as different greenhouses (with different plants or fruits) call for different requirements to support the measurements. This can complicate the further scaling of the solution in practice to other greenhouses or even other cooperatives. To mitigate this concern, SIP 4 defined the action of collecting data on the implementation of the solutions at farmers involved, with the aim to use this data to support further standardization of the solution. In addition, SIP 4 also intends to collect data on the performance of growers using the smart farming solution. In doing so, it is able to assess under what conditions this performance is achieved, allowing SIP 4 to further optimize the smart farming solution offered. Lastly, as part of the ongoing activities in Ploutos, SIP 4 also wants to explore how different agricultural models (i.e. supporting different crops) can be included for the smart farming solution. For the current smart farming solution, only a limited set of crops can be supported (for example, tomatos) as the smart farming solution only contains agricultural models supporting similar type of crops. This limits the type of growers that can be supported or the amount of crops that growers can cultivate which can be supported by the smart farming solution. Accordingly, this reduces the value that the smart farming solution can generate. Through the inclusion of additional agricultural models, this challenge can be overcome.

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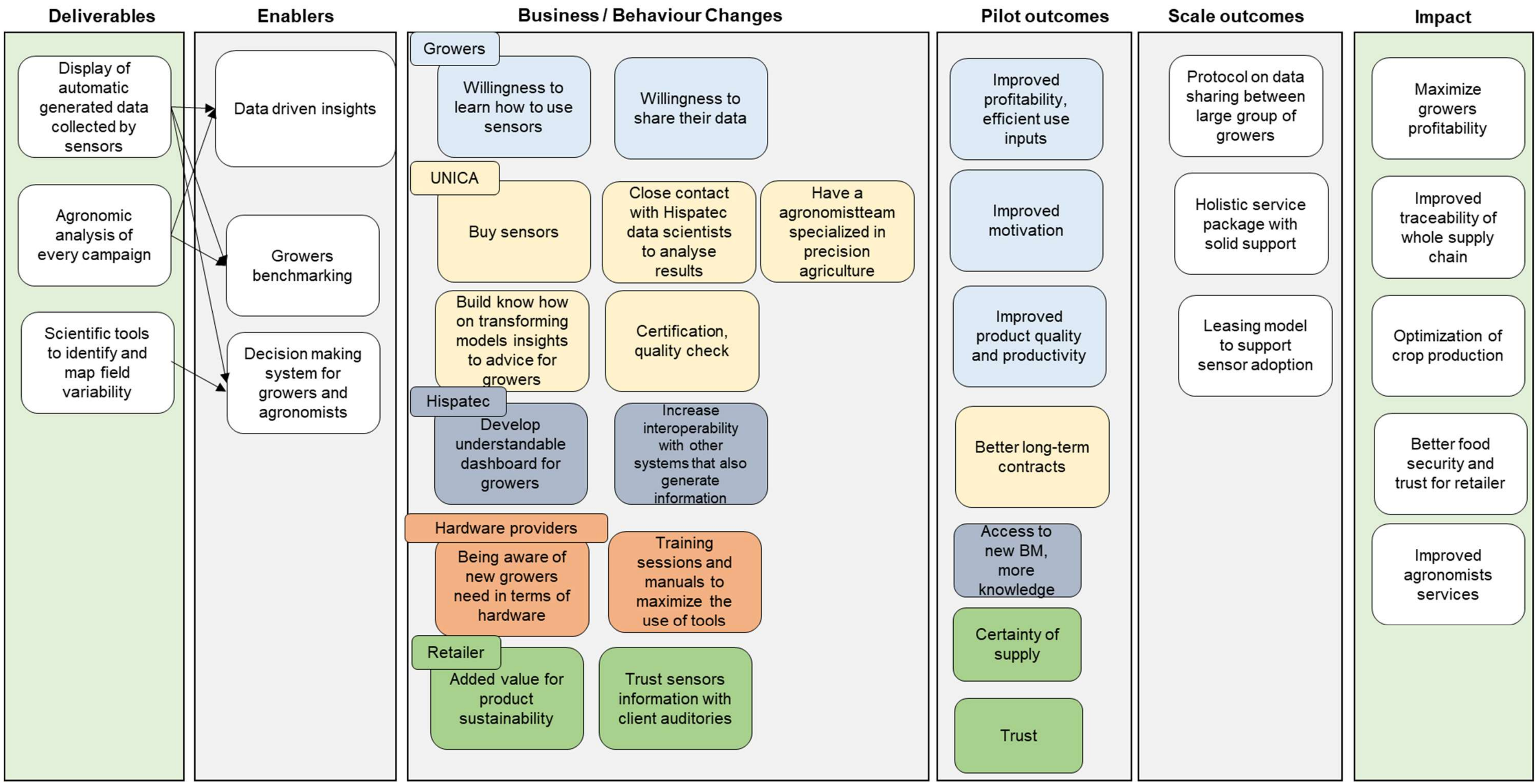

Figure 11 - Impact logic for SIP 4

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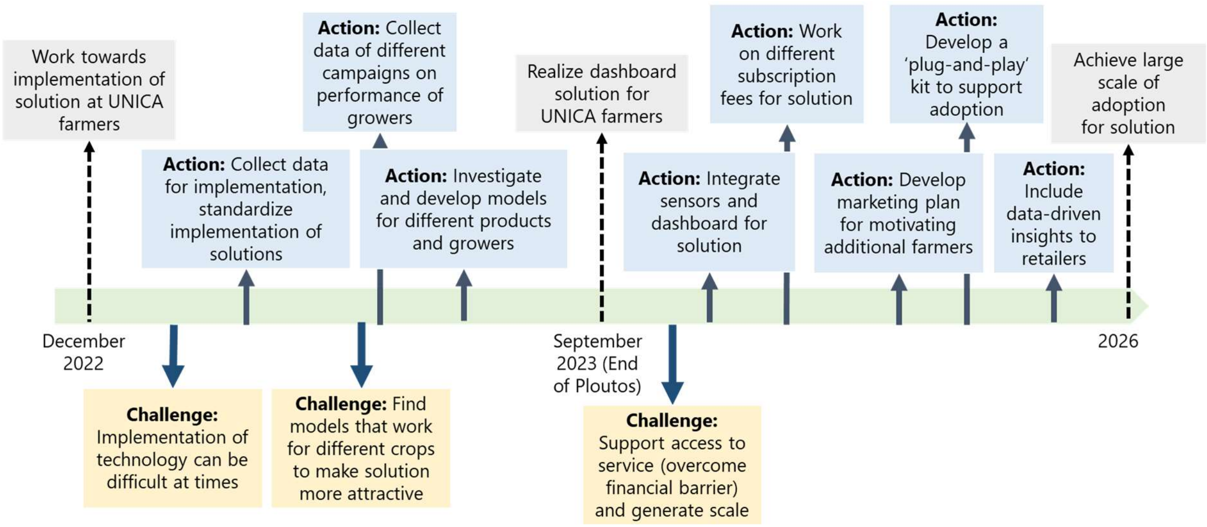

Figure 12 - Exploitation roadmap for SIP 4

The objective for SIP 4 up until the final phase of Ploutos is to develop a 'dashboard' solution which can (with some flexibility, depending on user needs) provide performance insights of crops to growers with limited efforts of the grower needed. Agronomists of UNICA can provide further support in terms of interpreting the results. Post-Ploutos, the goal is to further refine this solution – a major challenge here is the financial barrier which may be associated to the smart farming solution, as it calls for an investment in sensors as well as a service fee to use the solution in practice. Additionally, HISPATEC and UNICA collectively also would like to scale the solution to support more growers than currently considered for Ploutos. To do so, actions should be defined.

To address the challenges faced, SIP 4 will work towards a 'plug-and-play' type of solution, which removes the necessity to invest in sensors from 3rd party technology providers. This solution will include these sensors as part of its proposition, meaning that the grower is not burdened by additional costs to consider. To provide such a plug-and-play solution, SIP 4 will work on integrating the sensors as part of the solution such that the sensors can be connected to the solution in a standardized way, such that UNICA and HISPATEC can offer compatible sensors as part of the proposition to growers. To support the adoption scale of the solution, UNICA and HISPATEC will also work on developing new subscription plans as well as a marketing plan to motivate growers to adopt the solution. The former will look at pay-back schemes in which growers are not required to invest a fixed fee pre-use, but can use the earnings generated through the solution to pay-back these investments over time.

3.4.5 Next steps

As also indicated for the post-Ploutos actions, SIP 4 will concretely focus on onboarding hardware companies to ensure that a wide variety of sensors and systems can be connected to the smart farming solution. To develop new agricultural models as part of this smart farming solution (hence to be able to support different crops effectively) it is currently in talks of onboarding universities and resources centres to do so, to jointly develop the models needed to further enhance the value of the solution offered. Once these actions are completed, SIP 4 will dive into different commercialization models for the solution to offer to farmers: for example, it wants to investigate whether alternative variants of the smart farming solution can be offered which differ in terms of analysis and decision-making support offered. Accordingly, farmers with different income levels can be supported.

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3.5 SIP 5 – Agri-innovation

3.5.1 Solution and value proposition

SIP 5 focuses on providing a data-driven dashboard-based solution to *farmers* in the southern peninsula of Ireland (Dingle), connecting to applications such as weather stations or other measurement systems. Through this digital solution, farmers are able to generate insights on their current farming practices, which can contribute towards both *transparency* of farming practices (being able to communicate that food is produced in a sustainable way which can help in accessing different value chains or satisfying different consumers) as well as contribute towards *improved efficiency* of farming practices (using data to support decision making and to reduce water, fertilizer use). Additionally, such insights may also be used to increase the value of their propositions: for example, weather data can be used to provide real-time info to tourists visiting the peninsula. Accordingly, field visits or activities can be scheduled more effectively. To generate these insights, sensors are placed at ambassador farms which collect data on the sustainability of farming practices. This data is aggregated at the dashboard level to support decision making or to help the communication of their individual farming practices.

3.5.2 Business model design

Business model workshops with SIP 5 have yielded a dual perspective on the business models relevant to consider, addressing both a farmer level as well as community level perspective. On the one hand (the farmer level), access, analysis and visualization of farming data can help farmers in developing new (sustainability-oriented) business models, ranging from collaborations with food suppliers, providing their own produce locally and sustainably as well as moving towards agritourism propositions. The generic configuration implies that a farmer accesses a digital solution through a technology provider and consequently is able to create transparency on their farming practices and produce or receive advice on how to become more sustainable (and communicate this accordingly). On the other hand, SIP 5 also considers the value of *community-based* business model design which addresses the collective of farmers in the Dingle peninsula. Through community efforts (as well as the fact that the Dingle peninsula already is geared towards tourism propositions), the peninsula can be considered as a tourism destination which advocates sustainable farming practices and heavily builds upon local efforts of farmers. Logically, such a community-based business model can only be considered once a significant amount of farmers work towards sustainable farming practices. More so, participation of additional farmers can help in reducing investment costs for other farmers to join for this shared proposition (as benefits can also be shared).

The generic structure for the farm-centric business model design is illustrated in Figure 13. The central-value-in-use offered through the use of digital solutions is data-driven sustainable farming, which enables the farmer to generate insights on how to become more sustainable as well as enables the farmer to communicate its sustainable efforts to its own customers. The customer of the business model design is the **farmer**, which through use of the service solution is able to capture the following costs and benefits:

- Time savings for farming operations / improved efficiency of operations
- Sustainability effects which can be translated into monetizable outcomes for farmers
- Technology fee / smart farming fee to be paid. In the current business model design, this fee is set to be paid to the technology provider (in this case Net Feasa, providing sensors and services to support digital farming solutions)

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- Need to share data and adopt data-driven farming advice

The orchestrator of the business model design is **Dingle Hub**, responsible for kickstarting the business model and bringing the relevant parties (such as the sensor provider Net FEASA, the farmer's association IFA, the agricultural knowledge provider Teagasc and potentially other service providers) together to support the service provisioning to farmers. Its key role is to act as a *facilitator* to support the identification of business opportunities for farmers and to help start-ups grow. It also connects this to the data that is generated through the smart farming service. Therefore, Dingle Hub plays an important role in motivating the farmer to adopt the data driven solutions. Dingle Hub will not intend to collect a service fee for doing this as it is exchequer funded: in addition, it is able to generate income streams through other business models such as shared workspace rental or innovation projects. For the current business model design, Dingle Hub benefits from sustainability effects for farming on the Dingle peninsula as well as stimulate tourism for the peninsula. In terms of costs, general operating costs for operating the business model design are expected.

The smart farming service business model design is complemented by **Net FEASA, Teagasc** and **IFA** (the farmer's association). The role of Net FEASA is to support data generation activities. Specifically, they are responsible for deploying the sensors at farmer's locations and support the collection of data for Dingle Hub. For these efforts, Net FEASA receives a technology fee (which currently is paid by the farmer), but incurs costs related to sensor maintenance and development. As part of WP3, it will be further explored how the sensors are financed and whether potentially a dedicated service provider is included to support the smart farming service (as Net FEASA predominantly acts as a technology / sensors provider).

The role of **Teagasc** is to provide advice to farmers to improve their farming practices based on the data that is collected at farmers. It also helps in close collaboration with Dingle Hub to identify new business opportunities for farmers and to support ideating how data generated can be used. Through collaboration in the business model design, Teagasc generates knowledge on farming practices which can help its research and development activities. Additionally, Teagasc contributes to the sustainability of farmers in the Dingle peninsula. As costs, Teagasc incurs operational costs related to generating and providing the farming advice to farmers.

The role of **IFA** is to support the farmer and the adoption of the smart farming solution. This can vary between helping farmers on how to use the smart farming service or to integrate advice given through the service as well as exploring how the data generated can be used to foster new business models. IFA benefits through the business model design by support the sustainability of farmers on the Dingle peninsula. As costs, it generates operational costs to support the farmer.

Business model variants

As part of collaborative business modelling workshops with farmers in Dingle, we identified several (farmer-centric) business model variants which farmers (may) consider to capitalize on the use of the digital solutions. These business models are illustrated in Figure 14.

For the business model design on the left, farmers can use the sustainable value of its produce to collaborate with restaurants or to provide local food propositions to consumers or tourists. In this scenario developed with farmers in Dingle, farmers sell their produce (in this case milk products) locally by means of self-employed vending solutions or through collaboration with other partnering farmers or restaurants. Through use of the digital farming solutions, both the quality of the milk products can be improved as well as its sustainable nature can be emphasized and communicated. The former particularly can help farmers to cater to different consumer segments, for example

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segments which are interested in products which contain low levels of lactose. This business model is kickstarted through the support of Dingle Hub and involves certification partners to provide trust in the offerings presented by the farmer. More so, neighbouring farmers can support the business model through shared investments or through increased scale of milk production and sales. This business model enables the farmer to diversify from more traditional sales to food producers (which offers limited margins or limited potential of value capture in return by farmers). It represents a scenario in which the supply chain is shortened and farmers more directly control how their milk products are sold.

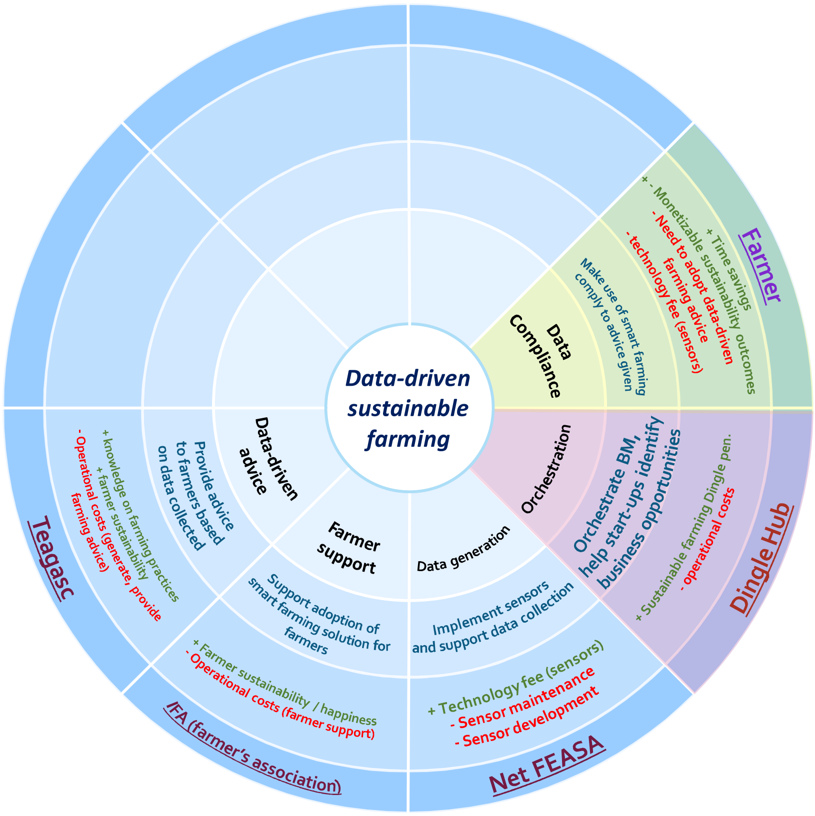

Figure 13- Business model design for SIP 5 (farmer level)

The business model design on the right (b) describes the scenario in which farmers in Dingle offer accommodation and stay-over services to tourists. Here, farmers can use their farmlands as a means to provide stays to tourists that wish to indulge in agri- or nature related experiences (such as farm visits, hikes, sea-side treks). They offer a complementary package to tourists which includes both accommodation as well as activities in close collaboration with activity providers. Similarly to the previous business model design, these activities may be executed by neighbouring farmers in the community of Dingle, increasing the amount of tourists that can be supported as well as offering a wide portfolio of farm visits that tourists may consider. Building this experience can be further supported through social media service providers, explicating the sustainable and local value of residing at a farm for an overnight stay. Here, the social media service provider may also take care of activities such as posting the availability of the farm on services such as AirBnB or Booking.com. To support this business model, the involvement of an insurance company (to insure against liabilities during activities or stay) as well as the technology provider for providing data driven insights and transparency in farming practices, but also for executing activities (for example, providing weather data to better time and plan activities for tourists to enjoy) can be considered. Again, the role of Dingle

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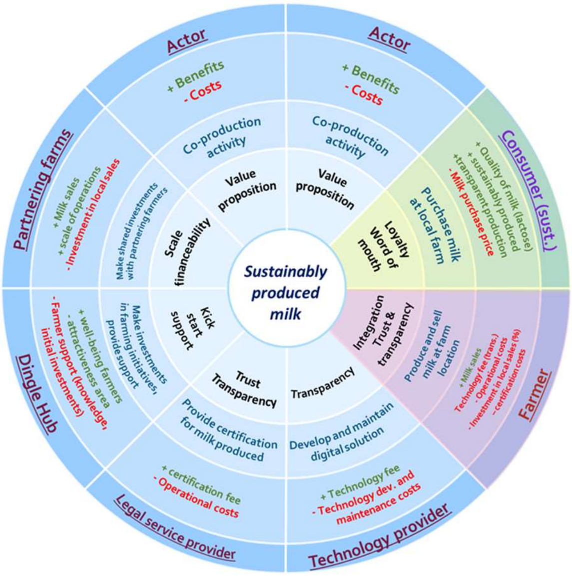
Hub is to kick start the initiative by making preliminary investments for the farm or to connect farmers to loans and subsidies they may use to support their initial operations.



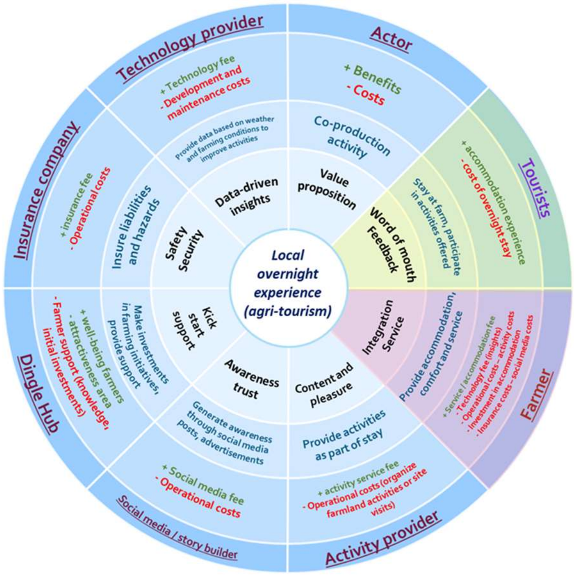


Figure 14 - Business model variants for farmers through use of the smart farming service

The community level business model design can only take effect if the *number* of farmers using the digital solutions increases to make claims on sustainability for the *entire* Dingle peninsula. This requires the smart farming solution to provide significant value propositions to individual farmers to do so. Again, the development of a bio district here (as indicated for the introduction of this chapter) will play a key role in this to stimulate additional value. Once sufficient scale of farmers adopting the service is reached, farming can be connected to agri-tourism, specifically tourism that values sustainability / sustainable food / sustainable farming practices. This business model design is illustrated in Figure 15.

One can see that in this business model design, the farmer becomes part of the business network to provide *sustainable, comfortable tourism services* to agri-tourists. Dingle Hub acts as the orchestrator of this business model design, bringing together relevant parties such as accommodation providers and service providers to offer a holistic service proposition to agri-tourists and connecting these to the sustainable value that farmers generate through smart farming service use. The holistic service proposition (a holiday experience in the Dingle peninsula) is compensated by means of a sustainable tourism fee. This fee is shared over the parties involved for providing tourist services (e.g. the farmer, accommodation providers and additional tourist service providers). For the farmer, this business model design implies that in addition or in replacement of its farming activities, it now focuses on providing sustainability-oriented tourist activities (farm visits, camp sites). This can be in collaboration with accommodation providers to provide comfort or with tourist service providers to provide entertainment or experience (depending on whether the farmer already has these capabilities in-house).

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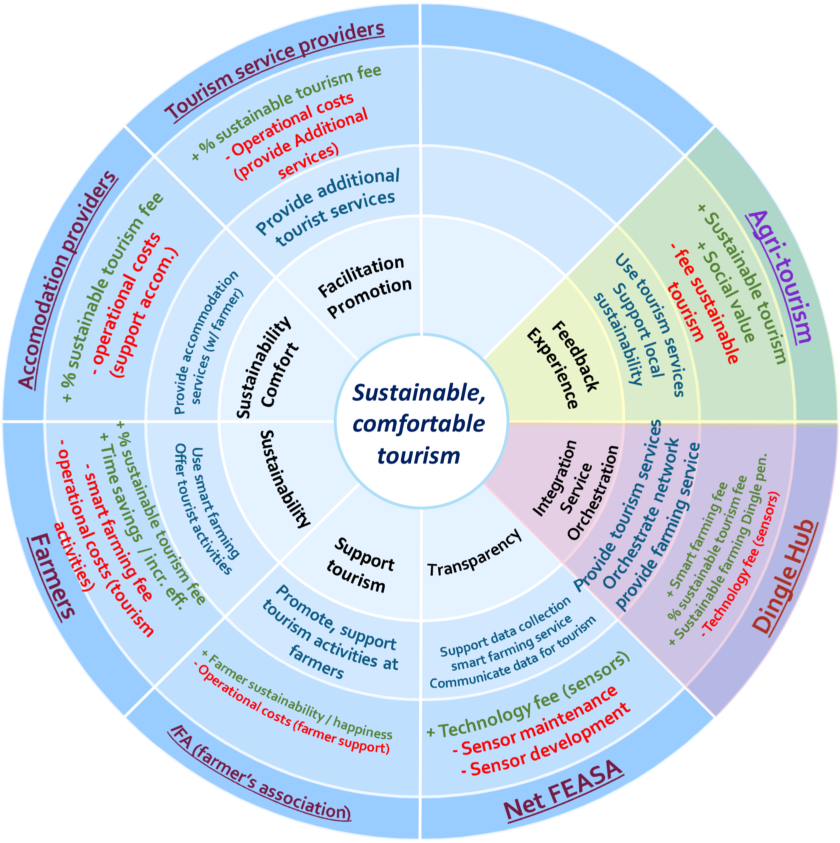

Figure 15 - Community-level business model design for SIP 5

3.5.3 Impact logic

Based on the (set of) business model design(s), the impact logic for SIP 5 can be drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 16. The main deliverable in SIP 5 (smart farming service through sensors at farmlands) enables farmers to generate insights on their farming activities as well as their performance. This also enables farmers to communicate the value of their efforts, particularly in regards to its sustainability.

To enable the farmer to do so, access should be provided by Dingle Hub to the smart farming service. This calls for smart farming service fees to be paid over time (by the farmer) as well as calls for general commitment towards using such a service. This commitment should stem from the value that is offered by means of the farmers which should be recognized. IFA, Teagasc and Dingle Hub play an important role here to make explicit why and how data is used to support the service as well as the role of the farmer. SIP 5 indicates that farmers are often traditional in nature: farming is based on gut feeling / experience whereas technology support is not that prevalent. It is therefore important that the value of using smart farming services is articulated and explained thoroughly.

In addition to the behavioral dimension to facilitate the smart farming service, the service is also dependent on the installation of sensors at farmers to generate and collect data. This task is executed by Net FEASA which should over time be able to scale to accommodate the many farmers to be involved. Once the sensors are installed, data can be generated on the basis of which advice can be given to farmers. Both the farmer and Net FEASA have a role in generating this data. Dingle Hub then provides advice to the farmer which should be adopted by farmers to generate sustainability effects / support sustainable farming. In addition to improving the efficiency and sustainability of farming practices, farmers may (as explained) also use the data to access different business models. As

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illustrated for the business model variants, data can be used to collaborate with food producers or to generate carbon credits. For the former, farmers are required to shift business practices and to set up collaborations with restaurants or food producers. For the latter, Dingle Hub is required to incorporate carbon credit platforms and to attract certification partners to do so.

In terms of pilot outcomes, the farmer benefits from improved farming efficiency, access to new business models and sustainable value which can potentially be monetized. Farmers are however required to follow up on the advice to achieve sustainability effects (this is particularly relevant for carbon credits which account for carbon storage over a longer period of time). Accessing new business models also implies that farmers have to (partially) change their business practices: new business models require new competencies (as opposed to farming) that are not always available.

To scale the solution from farmer level to community level, the number of farmers should be scaled over time. Adoption of the smart farming solution should be stimulated by IFA, Teagasc, Dingle Hub as well as existing users: sustainability effects particularly become apparent when adjacent farmers use smart farming solutions, as farmlands are often shared. This means that proliferation of the smart farming service is needed, especially in smaller communities of farmers. Through this community effect, Dingle Hub consequently can capture sustainability value on a larger scale to connect farming to agri-tourism.

In order to scale agri-tourism for the Dingle peninsula, tourism-based stakeholders should be involved such as relevant accommodation providers and service providers. Additionally, this has to be coupled to the competencies and capabilities at communities of farmers to enable services such as farm visits, camping or food tastings. This requires intensive collaboration between farmers, accommodation providers and tourism service providers and also builds upon data that is collected through smart farming services. Additionally, promotional activities to attract tourists should be conducted to raise awareness on the sustainable value of the Dingle peninsula.

3.5.4 Strategic implications and challenges faced

The business models for SIP 5 have several strategic implications and business challenges that should be addressed. First and foremost, the business models introduced impose quite significant changes for farmers in their their daily farming practices: farmers can now use the data to engage in different collaborations (for example with food producers or restaurants) or to provide tourism-based services such as farm visits or camping. Such new business models require farmers to build up additional competencies which can be considered as a major strategic shift. These changes should be explored with farmers that are willing to pursue them, and they should be consulted in what they need in terms of support to do so.

For Dingle Hub, the business models illustrated expand on the current portfolio of activities they offer, working towards a role in which Dingle Hub provides orchestration for tourism activities in the Dingle peninsula. It should be verified whether this fits the capabilities and strategy of Dingle and whether it is able to realize this set of business models long-term.

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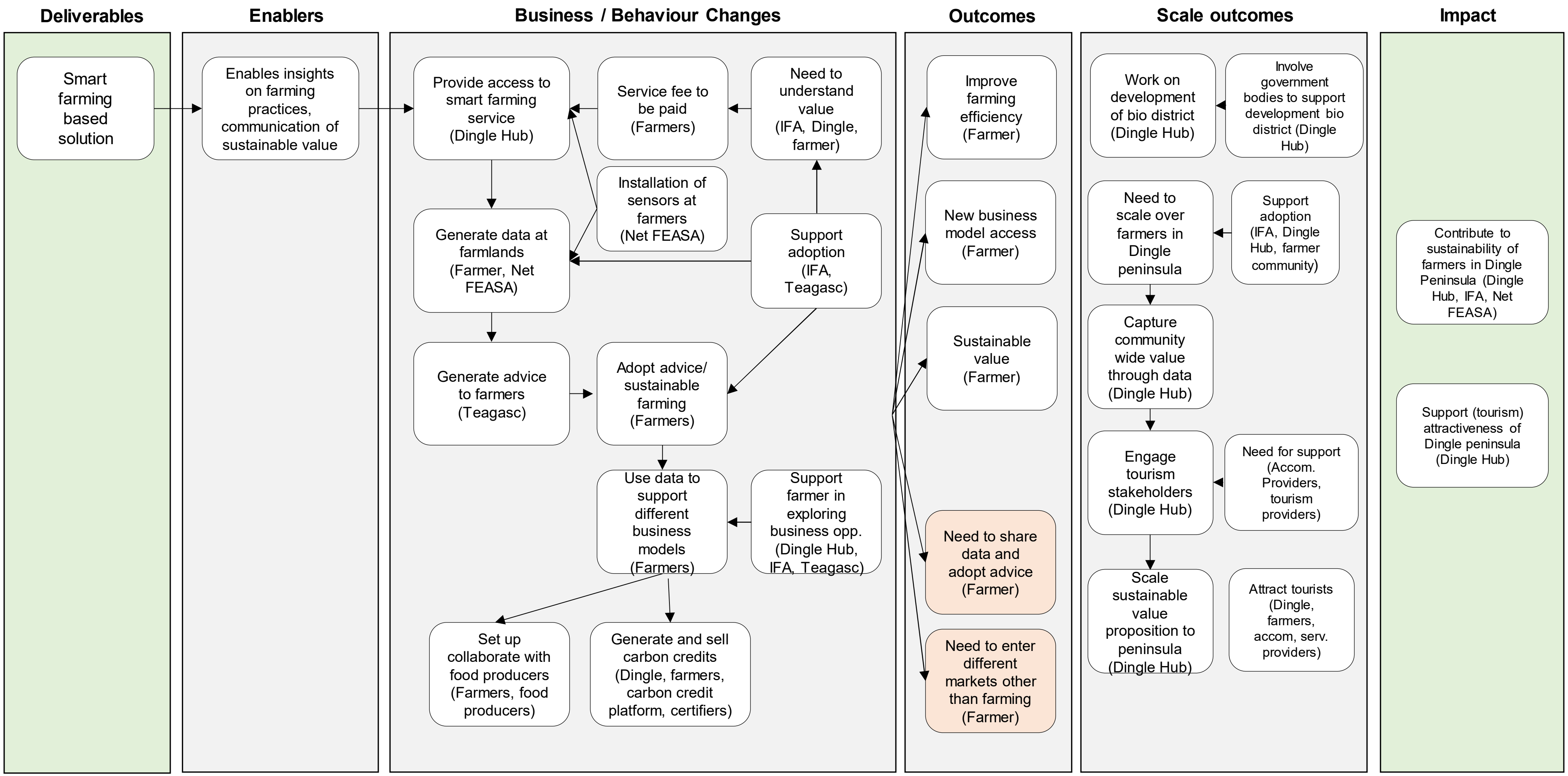

Figure 16 - Impact logic SIP 5

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Business model challenges

Many propositions in SIP 5 are geared towards agri-tourism propositions or propositions in which traditional farming operations are shifted to access different value chains. However, a main challenge to overcome is to ensure that farmers have significant capabilities (for example experience in providing tourism services, access or contact with local service providers) to do so and to provide such solutions: if farmers lack these essential capabilities, entering new business models may actually result in *more effort* or may not enable the farmer to capture value in return. Dingle Hub intends to provide such support services to farmers, but nonetheless may pose a challenge for farmers to overcome.

Part of this SIP is also focused on providing a viable livelihood for the rural farmers, such that the sustainable aspect of the SCBMI methodology will be of relatively more importance, both in the environmental and social aspects. Additionally, since the community is a core part of the current peninsula as well as the innovation, collaboration will be key not only to unlock value that is unattainable through a single-actor business model, but also in establishing and further strengthening the community as a whole.

In relation to the adoption of the smart farming service, the long-term financing of the service should be explored. In pilot settings, investments for and maintenance of the smart farming service offered can be supported through project funds. However, it will become difficult to rely on such funds long-term. A sustainable mode of financing should be sought after, here diversification in terms of value propositions as well as exploration of different business models (and understanding which configurations work) could help farmers in creating a sustainable income stream to sustain activities.

3.5.5 Next steps

In terms of next steps, SIP 5 will focus strongly on cultivating the investment climate for farmers in Dingle to develop new business opportunities. As illustrated by the business model designs which emerged through the on-site workshop, many farmers in Dingle intend to diversify their farming propositions, moving away from traditional collaborations with food producers for selling their crops towards propositions which focus on shortening the value chain (i.e. local sales of produce) or which stress collaboration with other sectors (e.g. tourism). To realize these new propositions, support in terms of grants or funds, but also in terms of entrepreneurial knowledge, to kick-start the new business models are needed. To this end, Dingle Hub will intensify its role as an innovation hub: it is working on identifying opportunities for farmers to access grant support through engaging with local and regional councils. It is also working with the farmers to set up exploitation plans and to identify where additional support (for example in terms of communication, marketing or scaling up) can be needed, or act as a mentor for farmers that are in the process of moving towards a new business model design. Through these efforts, Dingle Hub will improve its orchestrating capabilities and subsequently be able to support more farmers for the Dingle peninsula (allowing the adoption of digital innovation and sustainable farming to grow and scale over time).

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3.6 SIP 6 – Soil treatment and soil health

3.6.1 Solution and value proposition

For increasing efficiency of soil treatment and thus increasing soil health, new technologies need to be introduced for optimized fertilization, as well as innovative approaches such as a soil-passport centered system. This is rewarding farmers for maintaining or improving soil health. This SIP – "Soil treatment and soil health" – will focus on the introduction of precision farming techniques in Slovenia to support the optimal preparation of fertilization and spraying applications, combining different types of technologies and data sources, and on defining a potential soil-passport approach for Slovenian farmers.

The solution central to SIP 6 is a combination of modern robotic platforms, modern in-situ sensors, IT supporting systems and Smart Farming machinery, wrapped up in an advanced advisory e-service to farmers.

In terms of *social innovation*, domain experts will be trained to use state-of-the art solution which will result in producing new jobs with higher added value. Additionally small farmers will be able to transform digitally faster. In terms of *organizational innovation* we see a change of the business model at the public advisory service provider, that is being able to use digital technologies. In terms of *institutional innovation,* a possible change is created in the way how soil as a public good is treated and systematically improved by introducing a soil passport system which will motivate (not only financially) farmers to increase soil health systematically.

The value proposition offered as part of SIP 6 can be described as follows: The **smart farming solution** helps **medium- and large-scale farmers** with their soil health and production optimization by providing digital services such as sensor, drone and satellite data that lead to an optimized production plan that can be accessed through an open platform.

3.6.2 Business model design

The business model design which emerged through the SCBMI process for SIP 6 is illustrated in Figure 17. The central value-in-use is *sustainable and financially beneficial farming practices.* The customer / end-user of the business model design are **medium- and large-scale farms**, which will be following up on advice generated by the smart farming solution based on the data they provide. Through the use of the offered product, they are able to generate the following benefits (green) and costs (red):

- Reduction in fertilizer use
- Improved product quality
- Improved soil health
- Community building
- Service fee
- Time investment
- Decreased flexibility
- Operational costs

The solution is offered by **KGZS** which acts as the orchestrator of the business model design in which they:

- Provide data-driven advice.

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- Contribute towards community building through media coverage and appearance in local news channels.

In return for these activities, KGZS receives a service fee from the farmers as well as government subsidies it may access. Additionally, it is able to benefit from knowledge generation through experience (application of advice for different farmers). In terms of costs, operational costs related to providing the service to farmers are incurred, as well as service fees paid to other actors in the network.

ITC contributes value in terms of connecting new technologies, service providers and farmers. Accordingly, ITC is responsible for network integration, communication, and exploration between partners. This occurs largely through an online farm manager application that farmers can access to receive advice, which is based on analysis of Termodron. In return for this service, ITC receives a farm manager fee, as well increased network and project opportunities. In terms of costs, ITC is responsible for maintaining and developing the software application to which costs are associated.

Lastly, **Termodron** has the role of providing data-driven insights to KGZS, based on satellite and drone equipment and creating target prescription maps. Termodron receives a fee for remote sensing data (to be paid by KGZS), is able to increase their database for deep learning which improves the services for future customers and can build a better reputation among farmers. Again, costs are incurred related to data collection, analysis, and monitoring.

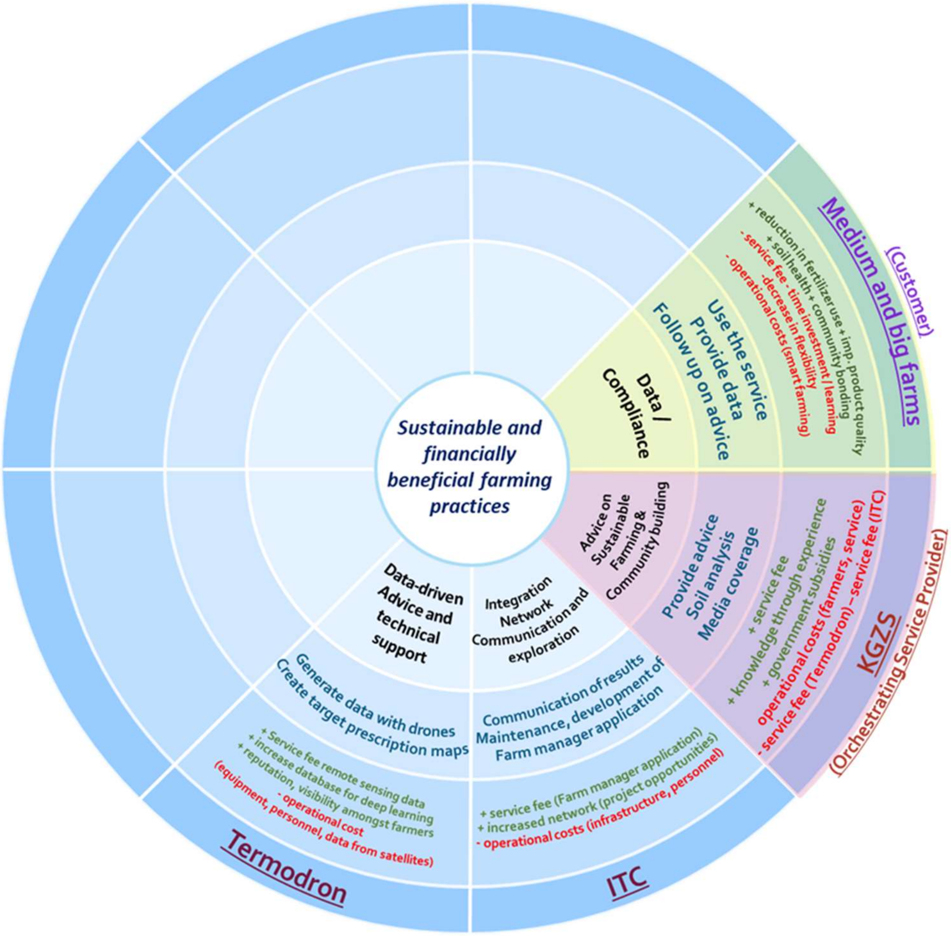

Figure 17 - Business model design for SIP 6

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3.6.3 Impact logic

Based on the business model design drafted, the impact logic can be analysed. The mapping of this impact logic (modelled through Benefits Realization Mapping) is illustrated in Figure 18. The deliverable central for SIP 6 is a smart precision farming service (owned by KGZS) that gives advice to reduce the use of fertilizers. KGZS is the orchestrator and owner of the platform, and thus has a strong role in defining how the advice is given.

To receive advice, data should be captured. This data capture is dependent on the input of the farmer as well as by satellite data which is given by Termodron and transferred to KGZS. After this KGZS collects soil and plant samples and analyses the data which forms the basis for the fertilization advice to the farmer. In SIP6, Termodron is thus included as the technology provider and generates prescription maps for the farmers which are communicated through the farm manager application. Farmers have some levels of flexibility in terms of following and adopting the advice, and they can change the amounts of fertilizer to be considered. The process of collecting input / soil sampling / prescription maps repeats every iteration for which fertilization is needed. Currently the application only works for fertilization, as pesticides is as a bit more difficult. Here, drones are expected to be used, but logically this serves more as demonstration (as using drones for all farmers, particularly on a large scale, is too expensive).

The advice to farmers and their compliance to this advice contributes to improving soil health as well as helps in reducing use of fertilizers. Both effects help farmers to become more sustainable in terms of farming. In SIP 6, 10 farmers are involved. In order to scale the innovation, the generated insights of this pilot will be shared among different farmers (sharing local knowledge on best practices to achieve community effects). In addition, knowledge and insights will be shared as part of open day sessions hosted by KGZS and ITC. Expanding the group of farmers involved is a task that can be handled jointly by KGZS and ITC. Here KGZS will provide support in building a community among farmers that want to use digital technologies in their daily operations. Education is needed for farmers to use the service properly and to understand how the farm manager can help their business practices – KGZS provides support but may have difficulties if large scales are pursued. In such cases, either KGZS has to scale as well or other sources of support should be explored.

In the long run, SIP 6 intends to support small and large farmers to reduce use of fertilizers. KGZS wants to increase their knowledge on the development of prediction and analysis models, as well as strive for sustainability / better position of farmers. This requires also the perspective of small farmers to be taken into account. ITC wants to connect farmers to service and solution providers such as Termodron and aims to achieve scaling in terms of farmers that are using the farm manager application.

It should be noted that in the current model, financing of the solution for the farmers may be difficult – equipment is expensive and not (yet) supported through KGZS / the solution. To achieve large economies of scale needed for the solution (and to generate long-term impact), government support may be required (budget availability at KGZS to help farmers acquire the necessary equipment). The new agriculture policy focused on reducing pesticides / fertilization may be a stimulus here.

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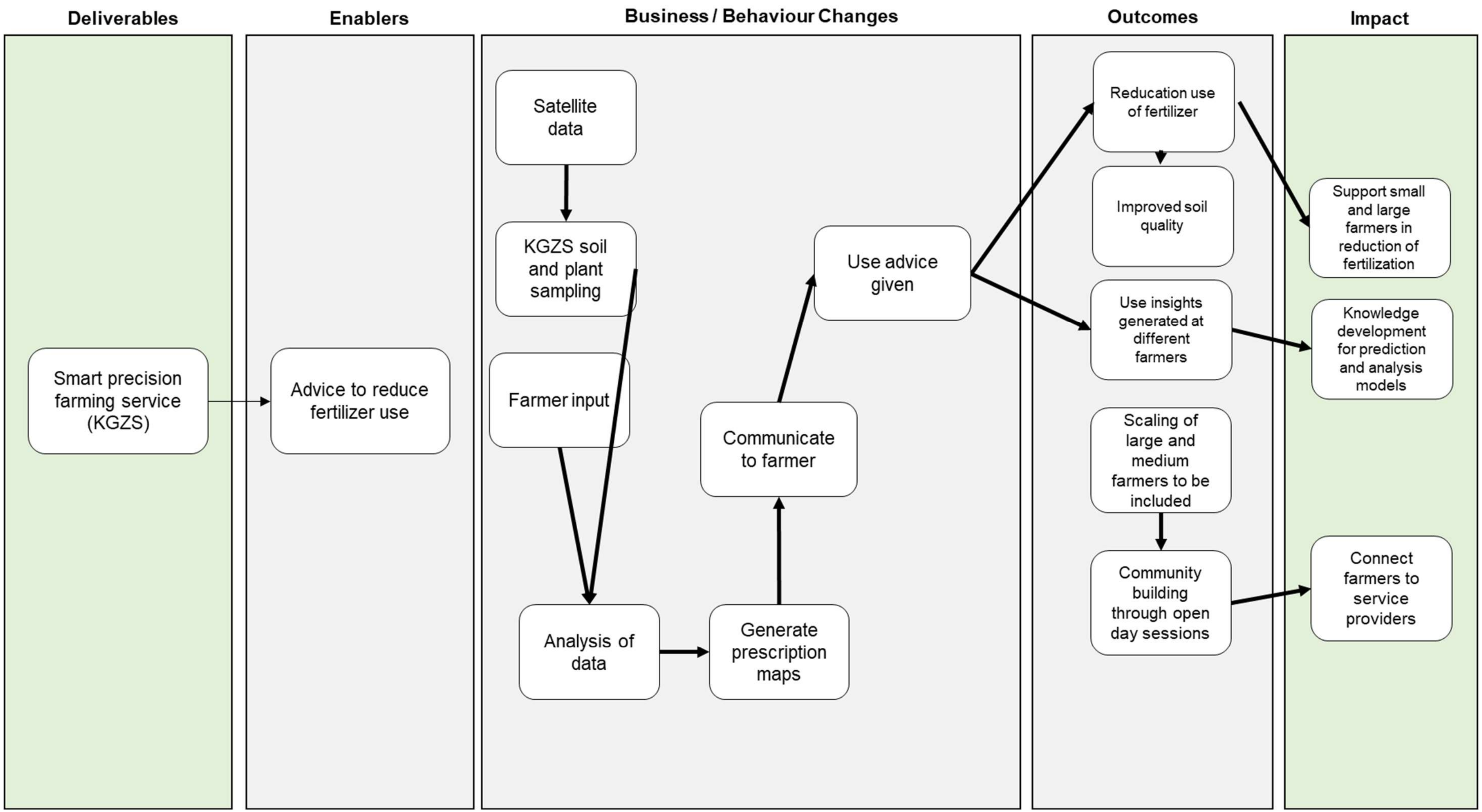

Figure 18 - Impact logic for SIP 6

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3.6.4 Strategic implications and challenges faced

In the current set-up, the investment costs are placed at the farmer to use the smart farming service. It is indicated that this can be quite expensive, and predominantly applicable to medium or large scale farmers. This may make the service offered inaccessible to low-income or small farmers. Here, communities of farmers could be or other financial support schemes to help farmers in accessing the service and to support sustainable farming practices. KGZS should be wary of how it can provide its services to farmers, and further explore to what extend external funding (for example through the soil passport which rewards sustainable efforts) can be considered to mitigate this challenge.

3.6.5 Ad-hoc support: detailed process analysis and set-up for cost benefit analysis

SIP 6 partners indicated to have a clear driver to move towards the marketization of the solution. Since the business model design generally is less concrete on how in time costs are incurred or investments are made (and often lack the granularity needed to support cost-benefit analyses), which can make it complicated to indicate how costly the solution will be, we conducted an initial workshop to further explore these costs per stakeholder in practice. We do so by *operationalizing* the business model design into concrete process steps to be taken. The results of this analysis are illustrated in Figure 19.

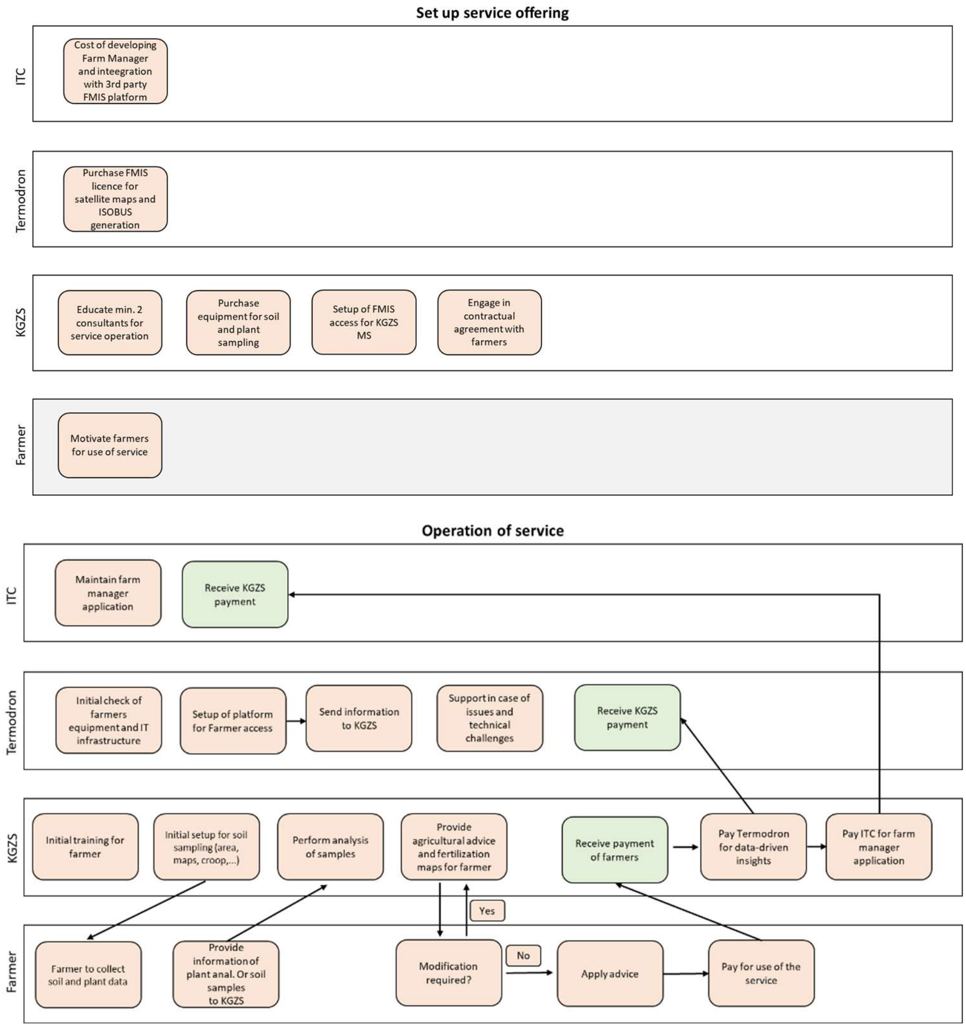

Figure 19 - Detailed mapping of investments made to support smart farming service

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For this cost benefit analysis, we distinguish between investments conducted *before* offering the smart farming service, as well as costs generated *during* its use. To provide the service, we see that all actors are required to make investments. For ITC, it concerns the development of the farm manager application (the platform to access the smart farming service) and to ensure integration with a planning platform such that activities can be assigned per week (FMIS). For Termodron, it involves the purchase of this FMIS system and getting licenses for the use of satellite maps, as well as a license for generating fertilization maps (ISOBUS system). For KGZS, costs are expected related to training consultants to use the service and to purchase equipment for soil and plant sampling. In addition, it also is required to connect the smart farming service as part of its internal management systems (such that the profile of farmers as well as advice given to farmers can be logged and managed over time). Lastly, before the service can be used, farmers should engage in a contractual agreement with KGZS, defining how long the service is used as well as what service level agreements can be expected.

During operation of the service, additional costs are expected. For example, we see that for ITC, costs are expected towards maintaining the farm manager application, which constitute general updates to ensure the platform remains operational. In return for this, it receives a periodic payment (further to be defined) from KGZS. For Termodron, initial checks of the equipment used at farmers is needed to ensure that data can be logged, and that farmers have suitable access to IT infrastructure to log information regarding fertilization and farming activities. These requirements should be fulfilled before the farmer can start logging. On the basis of this, the setup of the platform for the farmer is configured. This information is then sent to KGZS. During the course of using the platform, Termodron will continuously provide monitoring and issue management in case technical challenges arise. It receives a fee from KGZS for doing this.

KGZS will generate costs for training the farmer, as well as conduct sampling at the farmer to analyze the soil conditions. Any additional data needed to support the analysis (for example, insights on type of fertilizer used or irrigation applied) as provided by the farmer. It will then work with the farmer in building suitable advice based on the outcomes of the analysis and supporting the farmer in the execution of the advice given. Subsequently, the farmer is required to compensate KGZS for this service provisioning (by means of a monthly subscription fee). These fees collected at the farmers will be used to compensate ITC and Termodron for their efforts in enabling the service.

3.6.6 Next steps

In terms of next steps, SIP 6 will intensify collaboration with the other partners (Termodron, KGZS) as part of a different agricultural project, as well as farmers currently involved for Ploutos. To this end, the service will move from a working prototype towards a finalized solution (ITC, Termodron), such that the service can be offered by KGZS (and effects such as adoption and usability can more reliably be measured). As a result, the exact price and expected interactions for the farmers (i.e., what does the farmer have to do use the service, and to what extent can advisory services mitigate and issues of using the platform) will become clear. Here, it will also build upon the cost-benefit structure detailed as part of the ad-hoc process. KGZS will also actively focus on training its employees in working with the smart farming service and building advice based on this service. This will help SIP 6 in further deploying its solution in practice and aiding farmers in sustainable farming practices.

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3.7 SIP 7 – Wine Industry Digital Label

3.7.1 Solution and value proposition

SIP7 focuses on realizing a smart farming-based solution that, on the one hand, helps *wine grape producers* in Cyprus to improve their efficiency and sustainability for their farming practices, and on the other hand, aims to combine or link these efforts to premium prices for wines. Through the smart farming solution, data is collected on the cultivation conditions of grapes at producer's level. Using this data, agronomists can provide advice to grape producers for the efficient use of inputs. This data can then also be used to communicate sustainability claims (as it is transparent how grapes have been produced) for selling wine at associated retailers, at the farm/winery, or even through online platforms. The intention here is to include this as part of labelling practices for wine bottles (digital labelling), allowing consumers to scan the label (QR code) to get insights on how the wine has been produced (and by whom). In particular, the label will promote important information to consumers, related to the vineyards' location and soil type, grape varieties, alcohol content, ingredients, nutritional value (e.g., calories), contribution to environment, microclimate agro-environmental parameters (e.g., temperature, humidity), cultivation practices, etc. The learnings generated through the use of the smart farming solution are also intended to be shared with other farmers and wineries in Cyprus. Specifically, OenouYi winery is willing to share smart farming data and digital labelling concept with local wineries, farmers and consumers, aiming at the development of a collaborative business model that will help improving market transparency and the sustainability of the wine sector. The ultimate goal here is to generate community effects in terms of improved sustainability for the climate and landscape of Cyprus, provided that farmers use the learnings to improve their own farming practices.

3.7.2 Business model design

The business model for SIP 7 is illustrated in Figure 20. The central value-in-use offered by means of the solution is *sustainable and locally produced (traceable) wine*, emphasizing the fact that wine is produced in a sustainable manner and that this can be linked to the cultivation of grapes in Cyprus. The customer targeted by means of the business model design is the **consumer at retail stores**, **at the farm/winery, or even on the internet,** particularly those that are interested in purchasing or supporting sustainable, locally produced wines. Through the collective efforts of the business network consisted of OenouYi, Ari, community of farmers, NEUROPUBLIC, retailers and Filagro company, the consumer is able to generate the following benefits:

- Sustainable value, as the wines are produced in a sustainable manner (environmental benefits to the landscape and climate of Cyprus, which can be traced back).
- Social value through supporting local farmers in Cyprus.
- A premium price to be paid for the extra efforts made to produce the wine, which can potentially lead to higher profit margins for the local (small) wine producers (depending on their operational costs incurred).

OenouYi is responsible for orchestrating the business model design and the business network, while ensuring that the wines are produced in a sustainable way. It represents the 'main farmer' and employs agronomists and oenologists to do so. It takes charge of selling the wines at the winery or ensuring that the wines are packaged and transported to retailers to be sold there. They use the smart farming service offered by NEUROPUBLIC to generate data on their farming practices to foster

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sustainable practices and to ensure that the sustainable claim of the wines can be supported (by means of the traceability solution).

Using this business model design, OenouYi captures the revenue generated through the wine sales at the winery or at associated retailers. As indicated, it is assumed that a premium price can be charged for these wines as their sustainable and local nature can be made explicit (as a result of traceable farming practices). In terms of costs, OenouYi is required to pay an annual fee to NEUROPUBLIC for having access to the smart farming solution, which contributes to sustainable farming practices and enables OenouYi to communicate this sustainability claim to customers. Additionally, for some of the retailers, a retail fee is paid as a compensation for stocking and displaying the wines of OenouYi on their shelves. For other retailers, the wines are bought are higher prices which are then sold at a (higher) premium price to consumers. OenouYi also pays a consultancy fee to Filagro (exporting) company for investigating high-potential or high-price markets to which OenouYi can market its wines. Lastly, OenouYi compensates external farmers if their produce is used (typically through informal annual contracts), as well as incurs operational and staffing costs (a result of developing wine labels and generating, uploading and maintaining the traceability information online).

Besides OenouYi, the business model design is complemented by the following stakeholders: **retailers, community of farmers, NEUROPUBLIC**, **ARI**, and the **Filagro exporting company**. In the following, we detail the role of each of these stakeholders.

Retailers provide value to the business model design by means of *availability* and *promotion* of the wines. Their main activity is to stock the wines, such that consumers can purchase them as well as to promote the sustainable value of the wines. For stocking the wines retailers either receive a retail fee from OenouYi and/or can capture part of the premium price that is paid by consumers. If retailers stock the products of OenouYi, they are also able to expand on their current product offerings (meaning that through their collaboration with OenouYi they can offer a larger variety of wines to customers). Operational costs (in terms of marketing the wines and managing the restocking) can also be expected.

The **community of farmers** contribute value to the business model by means of the sustainable cultivation of grapes. They collaborate with OenouYi through informal annual contracts, in which agreements are made with OenouYi to sell (part of) their produce to OenouYi, which in turn uses these grapes for the production of wine. In return for their produce, OenouYi provides a financial compensation to these farmers involved. Logically, costs are incurred for cultivating the grapes in order to generate this produce. In addition to these activities, the community of farmers also benefit from the learnings which are generated by OenouYi through the use of the smart farming service. In collaboration with ARI, these learnings are disseminated to local farmers in Cyprus to help improving their sustainability efforts. As a result, the community of farmers is also able to benefit from knowledge on sustainable farming practices.

NEUROPUBLIC is responsible for enabling the smart farming solution, installing sensors at OenouYi's fields to support the collection of data and the production of data-driven advice, such that OenouYi can use it to improve on its sustainable farming practices. As data is collected on farming practices, NEUROPUBLIC offers value in terms of the *traceability* of farming practices: the data can be used to demonstrate that grapes have been produced in a sustainable way. These insights can be integrated as part of labelling practices for wine bottles that are sold. In return for providing the smart farming service to OenouYi, a fee is received from OenouYi. This fee should offset the costs incurred from sensor development and maintenance as well as general operational costs (collection and management of data).

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ARI's role in the business model is basically institutional. Specifically, as a public research institute under the Ministry of Agriculture, Rural Development and Environment —meaning that it supports policy making through research— will promote the benefits of smart farming technologies and digital labelling to farmers/wineries in Cyprus (scaling-up). ARI also drives the sharing of accumulated knowledge in terms of sustainable farming practices to the farming community in Cyprus, which is in line with their main benefit captured through business model participation. To do so, operational costs in terms of knowledge dissemination are expected (workshops, on-site visits to farmers, analysis and communication of knowledge generated).

Filagro exporting company, in collaboration with OenouYi's marketing team, will make efforts to reach high-price markets in other countries, as well as to reposition the wines in the local market, aiming at reaping additional value. For doing so, Filagro exporting company receives a consulting fee from OenouYi. Logically, operational costs are incurred to target and access high-price markets in other countries / strengthen the position of OenouYi wines in the local market.

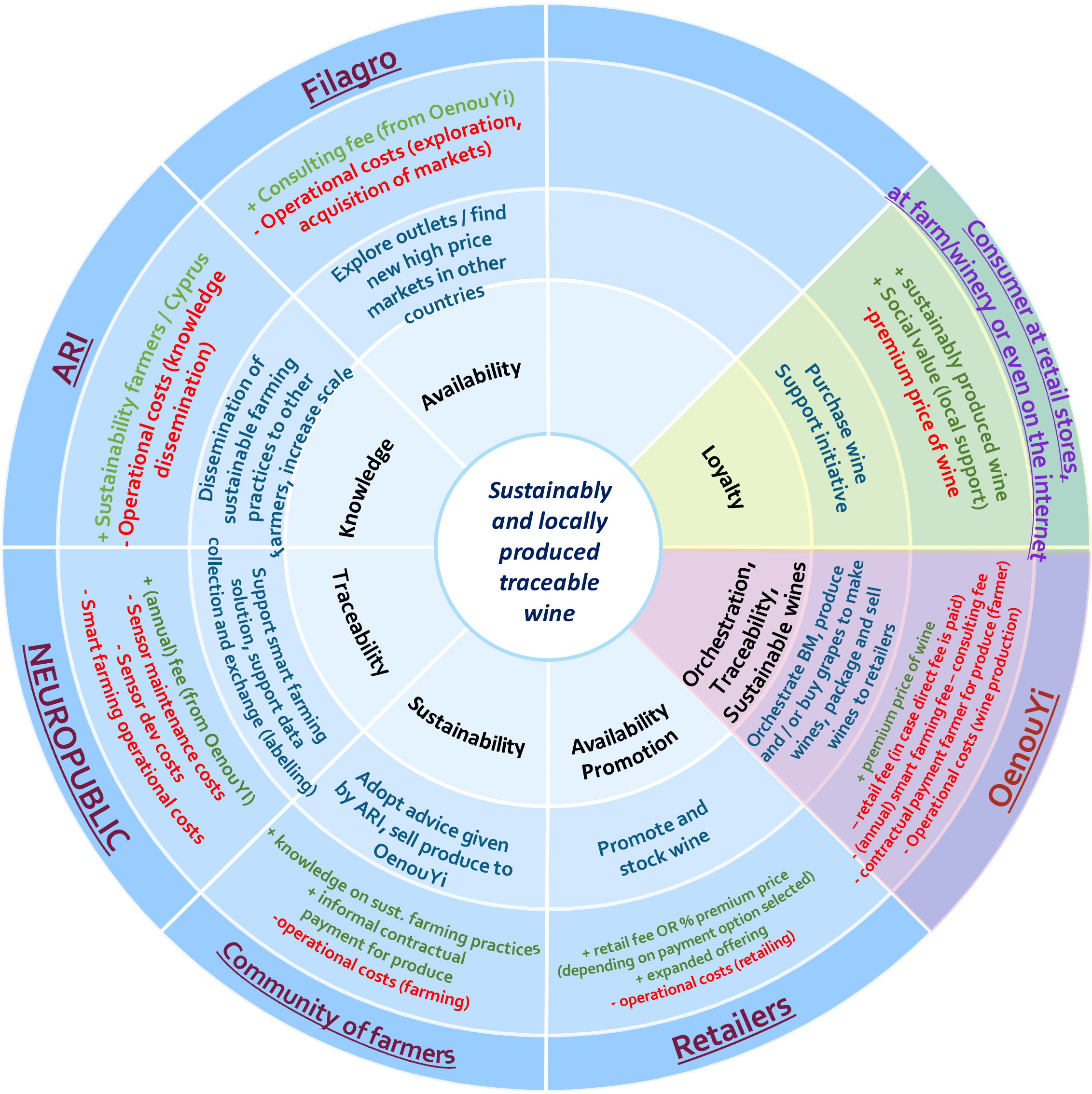

Figure 20 - Business model design for SIP7

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3.7.3 Impact logic

Based on the business model design, the impact logic for SIP7 can be drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 21. The deliverable central in SIP7 (the smart farming service and traceability solution) enables OenouYi to generate insights on its grape cultivation activities and performance. It also enables OenouYi to improve its sustainability level and efficiency for grape cultivation, as well as enables OenouYi to make explicit how grapes have been produced in order to prove sustainability claims. This is in line with the solution proposed (i.e. using data to support sustainability claims through digital labelling). On the other hand, the learnings generated through the smart farming solution can help other local farmers to become more sustainable as well.

To generate the insights through the smart farming service, access to the service is needed. OenouYi pays a service (annual) fee to NEUROPUBLIC to do so: this involves sensor installation at the fields to support the collection of data. An important task is also present for OenouYi in terms of motivating and supporting other local farmers/wineries to adopt the smart farming service, as well as sharing, with the agreement of NEUROPUBLIC, some agro-environmental data of the service and digital labelling concept with other farmers/wineries. For this purpose, the value of the service should be made explicit to the farmers (i.e. why they need to use the data sharted by OenouYi and comply with the given advice, and what advantages can be obtained).

Once the infrastructure for the smart farming service is in place and access has been provided, data collection commences. On this basis, NEUROPUBLIC generates and provides advice to (agronomists of) OenouYi to monitor performance. This advice sheds light on how the winery can improve, in a sustainable way, its farming practices. The advice should be adopted in order to justify the sustainability claims. It is therefore key that this adoption is facilitated and supported through agronomists of OenouYi.

Once the grapes have been cultivated and harvested, the wines can be produced and transported by OenouYi to associated retailers. This requires finding retailers that are interested in being part of the business model design (buying wines from OenouYi and selling them to consumers in premium prices) and can access a sufficient base of consumers. These retailers then stock the wines assuming that a premium price is to be paid by consumers as a result of the sustainable and local produce.

Outcomes are expected for OenouYi and other farmers in terms of achieving premium prices for produced wines and increased farming efficiency. Additionally, the sustainable and social value created through the business model design may also appeal to consumers. To achieve these benefits, the farmer is required to comply with the advice given and to share data for the smart farming solution. It is noted that some farmers are contracted with OenouYi, thus creating the sense of 'control', since cultivation practices are now increasingly becoming more transparent. It should therefore be explored how this data will be used and who is allowed to gain access to or use this data.

Scaling strategies can be adopted for expanding current operational practices with the aim to increase market share in other countries. OenouYi may achieve these scaling by collaborating with other wine producers in Cyprus or farmer associations. The goal here is to contribute to (increased) sustainable farming practices in Cyprus and to support local farmers.

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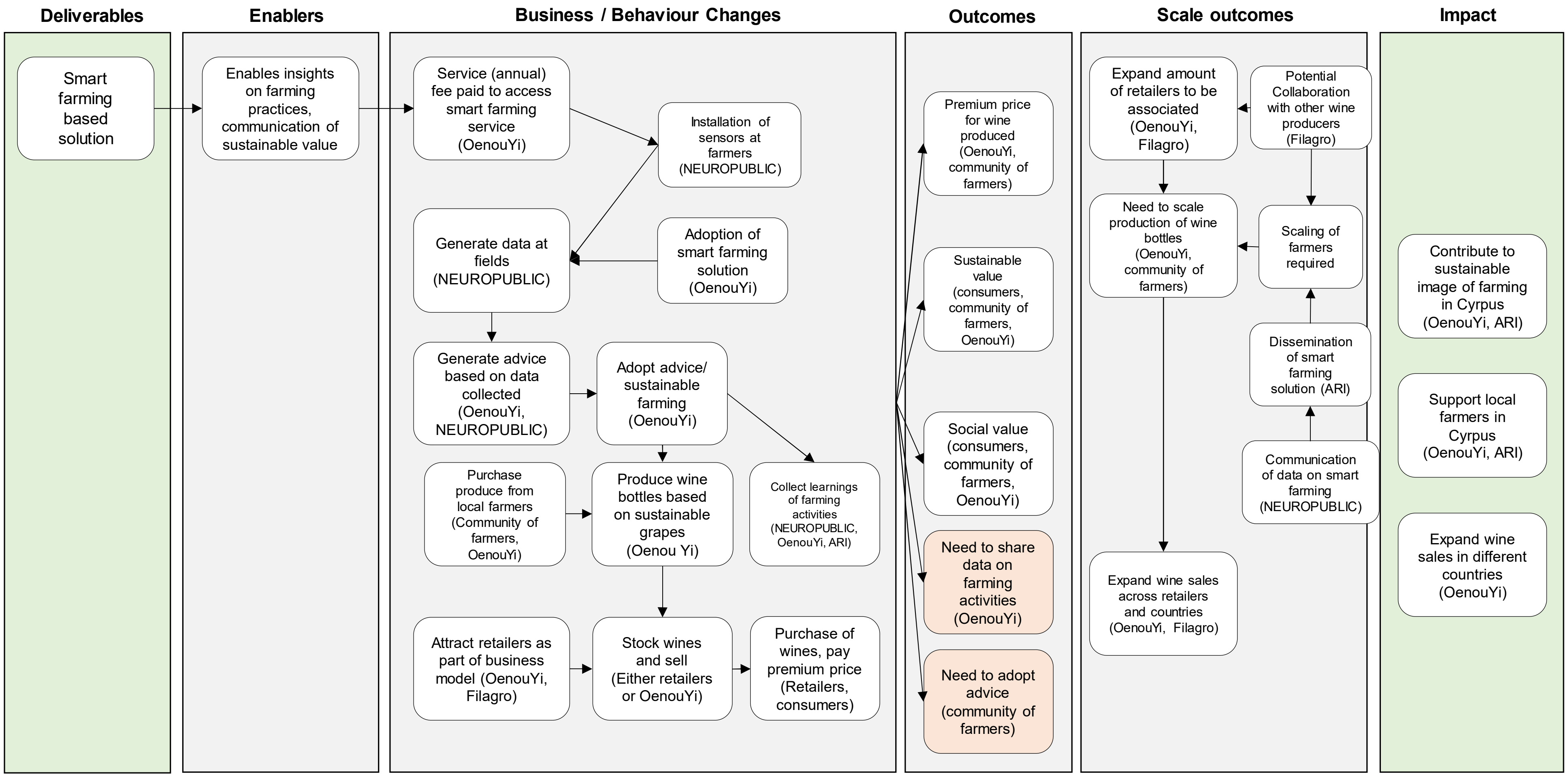

Figure 21 - Impact Logic for SIP7

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3.7.4 Ad-hoc: exploring the realization of digital labelling in practice

To explore the adoption and use of digital labelling in practice for wineries in Cyprus, and to generate opportunities to create and capture additional value for wineries, we deeper investigated the value proposition for digital labelling. In addition, we explored different, collaborative business models solutions to support their realization in practice and their impact on value creation. This was conducted through an online collaborative business modelling workshop with SIP 7 stakeholders. The workshop was therefore divided into two parts:

1. Understanding the value, implications and barriers for the adoption of digital labelling practices.
2. Exploreing business model solutions that support digital labelling and adapting them in the context of a collaborative business model.

Understanding the value, implications and barriers for adoption of digital labelling

For the first part, we held an open discussion on how the digital label works in practice, and what information needs to be communicated as part of the label to create value for consumers or to make the wines sold attractive to them in the market (allowing farmers to reap additional value in return). Here, we conclude that the environmental and local aspect of wines is appreciated by consumers in the market, to which a premium price can be associated. However, we also see that the information communicated as part of the digital label should be relevant and appreciated by consumers (i.e., it should motivate consumers to continue their purchase). Although initial insights have been generated through consumer surveys (and as the two wines with a digital label can currently be bought in local winery's restaurants or outlets), it would be valuable to investigate what information resonates with consumers and helps in explaining the core value proposition (local and sustainable) and how this can be communicated (for example through color-coded illustrations).

The discussion also helped in understanding the role of the smart farming solution. The smart farming solution contributes towards improved decision-making on the inputs needed for grape cultivation (and could also allow wineries to access services such as carbon sequestration or certification). However, information on the cultivation practices also could serve as input for the digital label. Although the digital label *can exist* on its own, its value can be enhanced through insights generated as part of the smart farming solution. Therefore, supporting the adoption and use of the smart farming solution can significantly contribute towards the effectiveness of digital labelling.

A challenge for the digital label is that on the one hand, it has to comply with regulations that require the label to include information such as ingredients and the nutritional declaration of the wine produced. On the other hand, the digital label can serve as a powerful marketing tool, allowing farmers to communicate their sustainable efforts through the label to differentiate themselves from other wines available in the market or to be more attractive to consumers. However, the new regulations indicate that such information is not allowed to be merged under a *single digital label* (i.e., through a single QR code). It is however less appealing to consumers if a wine bottle includes two or more QR codes to serve different purposes; this would likely cause confusion for consumers on what QR code(s) should be used for which purpose. SIP 7 is actively investigating how this challenge can be addressed through discussions with the competence authorities (e.g., ministry of agriculture) and examine whether the current regulations have been misinterpreted.

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Explore business model solutions supporting digital labelling

In the second part, several business model solutions (building on the reference business model archetypes presented in D3.4) to support the adoption and use of digital labelling were investigated. Here, we considered the following solutions:

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

The solutions *cooperative branding* and *cooperative purchasing* resonated with SIP 7 stakeholders. 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 strategy 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.

It is indicated that in order to form such a brand, the involvement of the Cyprus Chamber of Commerce and Industry would be useful to support brand development. Although the Chamber of Commerce and Industry can support access to funding for achieving this, wineries are generally reluctant to invest and collaborate as part of a brand, unless they are supported with additional investments – this is due to the fact that the benefits associated to the brand (such as increased awareness on the sustainability and locality of the wines, reaping premium prices) are uncertain and depend on other external factors, outside wineries'power, such as consumers' perceptions. Therefore, the commitment of an initial cluster of wineries that will lead the brand development is required to support this activity (after which then this brand can be scaled up over time). Moreover, market segmentation analysis is required to ensure that the brand caters to one or more different consumer segments. Again, an investigation of what motivates consumers to select a certain brand (and how this decision-making process takes place) is worthwhile.

Collaborative business model to support digital labelling in practice

The results of the workshop were summarized as part of a collaborative business model, detailing how digital labelling can be supported in practice through cooperative purchasing and cooperative branding. The result is illustrated in Figure 22. It can be seen that in addition to the consumer, collaboration (cluster) of wineries and Chamber of Commerce and Industry, the stakeholders NEUROPUBLIC, ARI, Filagro and external investors are involved. The cluster of wineries will jointly collaborate with NEUROPUBLIC to support the investment in smart farming solutions and consequently digital labelling. As indicated, joint investments or shared equipment can be expected here. ARI and Filagro will work on understanding how the common brand should be positioned in the market. Accordingly, this involves a deeper analysis of what drives consumers to select a certain wine

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and how aspects such as sustainability and locality of the wines can be elevated as part of digital labelling. Lastly, investors might contribute (co)financing the business model design: these investors will provide funding for to develop and scale up the brand over time. Currently, investments can be expected by through funding opportunities at the European level or through leveraging national resources via the Chamber of Commerce. However, private investors (with drivers such as sustainability and locality) aligned with the character of the brand could be considered.

As mentioned, the development of the brand will take time and effort to flourish. Therefore, it is expected that wineries, on the one hand, will focus on their individual business model, using the smart farming solution to optimize their cultivation practices and to strive for increased product quality. On the other hand, the collaboration of wineries can gradually work towards building the common brand.

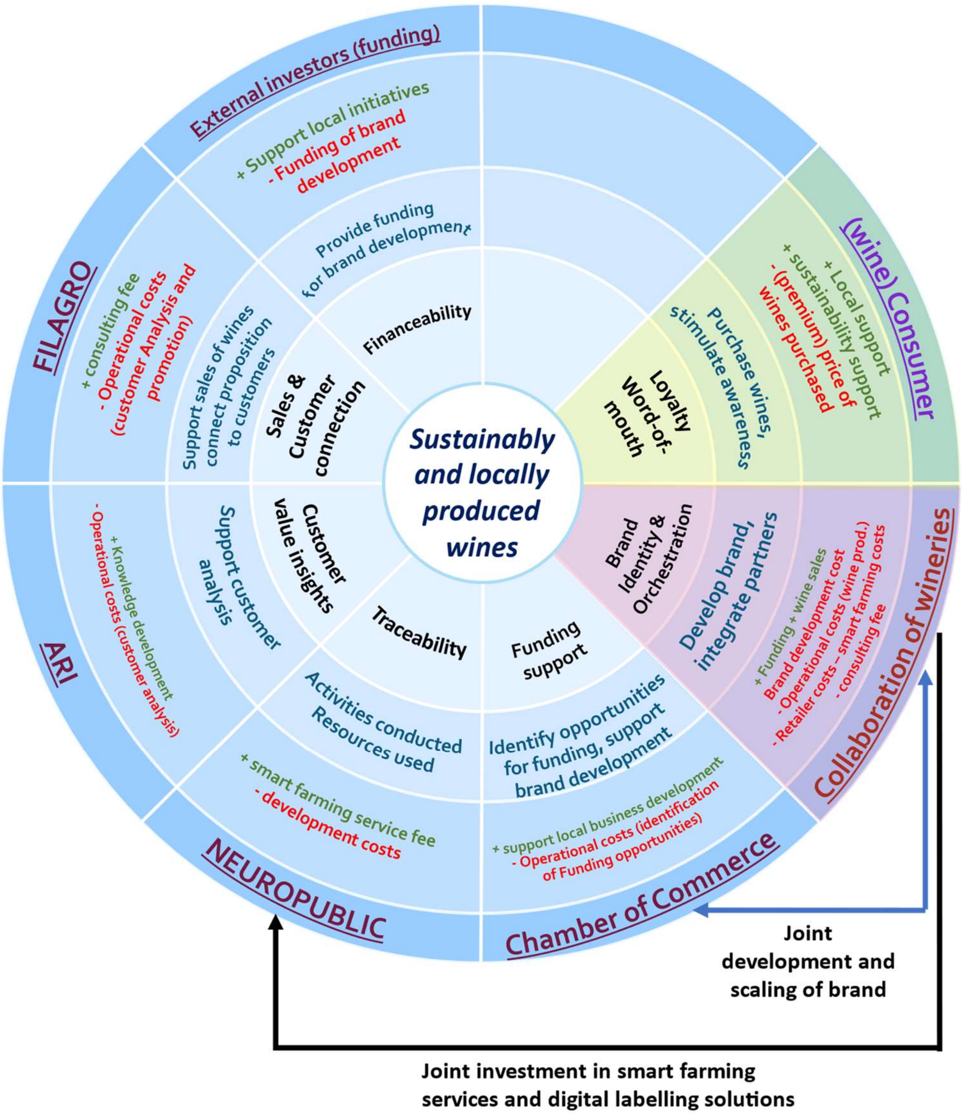

Figure 22- Business model design for SIP 7 supporting digital labelling

Through this brand, the sustainable and local nature of the wines can be elevated, which might help wineries to get premium prices for their wines. This logic of how both business models are used to work towards a scalable brand is illustrated in Figure 23.

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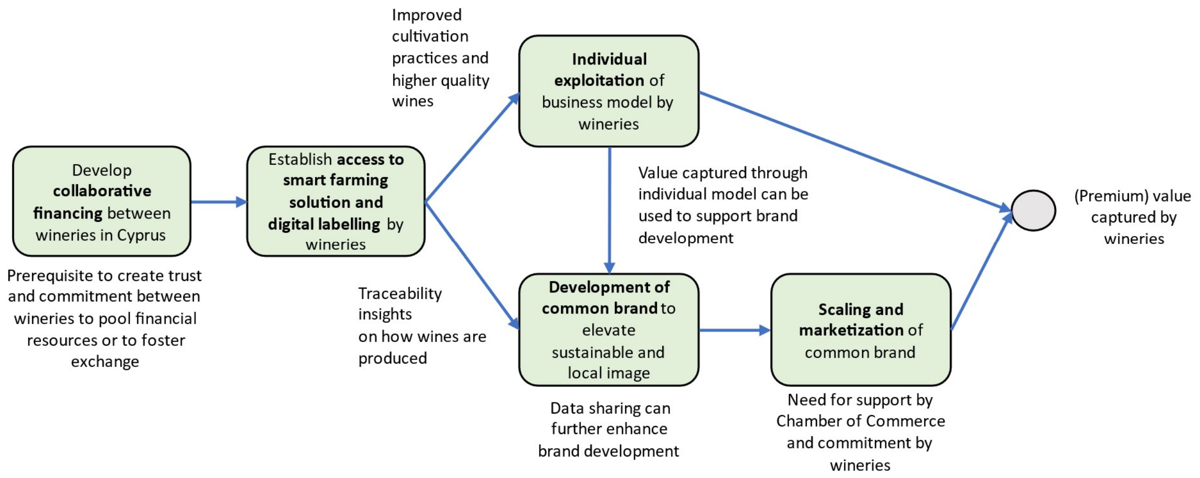

Figure 23 - Exploitation logic for developing common brand for wineries in Cyprus

3.8 Next steps for SIP 7

SIP 7 intends to leverage the insights generated through the SCBMI, as well as the work on behavioral innovation, to further investigate how such collaborative brands between wineries can be established and how digital labelling can be used in pursuit of this. The learnings generated serve as the basis for future research and project development on establishing collaborative brands for wineries in practice. Specifically, given the challenges highlighted, SIP 7 would like to focus on the customer preferences and customer decision making process that take place when selecting a certain wine. On the one hand, this helps to better understand how brands should be positioned by (collaborations of) wineries to target different customer segments and to capture premium value. On the other hand, it helps to better understand what information should be communicated as part of the digital labelling, motivating and incentivizing customers to continue their purchase, and capture the sustainable and local nature of the wines sold.

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3.9 SIP 8 – Soil Carbon Tool

3.9.1 Solution and value proposition

The solution central for SIP 8 entails a (platform-based) service focused on carbon sequestration that provides data-driven insights to farmers to improve their soil management. Through using the platform, farmers can enter data on their soil conditions and consequently receive insights on how well their soil is performing (in terms of carbon stored) and receive advice on how to improve their soil management. The main advantage of using this tool over existing ones in the market is the fact that the tool proposed for SIP 8 leverages model-based analysis to calculate carbon stored for the soil (as opposed to measurement based). This significantly reduces the costs of the service whilst still providing reliable indicators and advice on soil management to farmers.

Additionally, and core this business model, SIP 8 intends to connect the efforts of farmers to store carbon for the soil to some form of financial compensation for the farmer to stimulate carbon sequestration (which has positive environmental effects). To do so, the solution offered for SIP 8 also enables farmers to earn (validated) carbon credits based on their carbon farming activities. These carbon credits can consequently be sold on open markets or to dedicated suppliers. The Dutch farmers' association ZLTO is the orchestrater in this SIP. They connect the farmers to the end user of the carbon credits.

The process in SIP 8 is intended as follows: During the reproduction and growing phase, the solution generates machine data (collected through sensors on tractors and farming appliances) to be used to support the model-based analysis. Here, the farmer is also expected to apply compost and store carbon for the soil based on previous advice given. Similarly, for the harvesting phase, suggestions are given to prepare the soil for next seasons. Once the produce is harvested and ready for wholesaling, the solution collects satellite data on soil performance as well as reads the data provided by the farmer and machine data. Based on this, a sustainability indicator is calculated, whereas based on the delta of carbon captured credits can be earned. This process is (periodically) verified by a third-party verification partner. Once verified, the carbon credits can be sold / transferred through the solution to interested projects and organizations.

This model as envisioned by ZLTO has been implemented in practice by UDEA, a leading organic trader in the Netherlands. Climate neutral business operations are a focus point in the corporate social responsibility policy of UDEA. Efforts have been made to reduce carbon emissions as much as possible and currently UDEA is focusing on compensation of the remaining, non-avoidable carbon emissions, mainly caused by transport. For this they choose to sequestrate atmospheric carbon in agricultural soils. The benefits of this method are that it strengthens the relationship in the supply chain with the Dutch farmers that sell their produce to UDEA; it is a local solution; and it has the potential to become a unique selling point for Ekoplaza products (part of the UDEA group).

Currently, most farmers that produce for UDEA are not using all the available techniques to optimize carbon sequestration. One of the most important reasons being the lack of (financial) reward for additional efforts to optimize the sequestration of carbon.

In this SIP, the example of UDEA has been used to design a similar business model for ZLTO.

3.9.2 Business model design

All participants in the SIP have worked together to create a business model, using the Business Model Radar (BMR). This BMR is included in Figure 24. The central value-in-use is *Transparent and partnered*

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farmer-based CO_2-compensation. Here, the business model design takes projects or organizations interested in buying (locally sourced) carbon credits as the customer segment.

In this radar, the co-created value-in-use is considered in the context of the customer **ZLTO Partner (e.g. UDEA),** which is the end-user of the carbon credits in this case. The value proposition of the ZLTO Partner (e.g., UDEA) is supporting their farmers, relationship management while at the same time reducing their carbon footprint. By using the solution offered, the farmer is able to obtain the following benefits and costs:

- CO_2 neutral products
- Sustainable image
- Relationship with farmers
- Managing / operational costs
- Carbon credit fee (farmers)

ZLTO is the orchestrator in this business model, meaning that they are the central actor and play a vital role. In this role, ZLTO:

- Is the main point of contact for the other actors in the business model
- Collaborates with the ZLTO partner (e.g., UDEA) and offers advice on carbon farming; connects the ZLTO partners with the other actors
- Provide advice and support to farmers on farming and carbon farming
- Acts as the link between the farmer and the tech providers (Farmhack, NMI) and certifying agency (Peterson)
- Organise the financial side of carbon farming and receive a service fee from the farmer for their service
- Collaborate with the certifying agency to validate the carbon credits

Farmers are another set of important actors in this business model. The farmers are the actors that obtain the carbon credit fees from the ZLTO partner by performing the carbon farming, while at the same time increasing their sustainability. ZLTO provides advice to the farmers on how to do so and farmers pay a service fee to ZLTO. The farmers have to acquire / invest in technology to measure the carbon storage and maintain this technology. Another additional cost are the operational costs for sustainable farming.

Technology Provider **NMI** provides technology for the farming activities. They collect and monitor data on farming activities and provide data-driven Insights on farming activities. They receive a fee from ZLTO to do so.

Certification agency **Peterson** is tasked with validating and certifying the carbon credits that a farmer has accumulated by carbon farming. Once the carbon credits are certified, the farmer can sell those carbon credits to the ZLTO partner or on the open market. Peterson receives a certification fee from ZLTO for their service.

Farmhack is an additional technology provider. They collect and monitor data from farming activities (from tractor data) and provide data-driven insights. They receive a fee from ZLTO.

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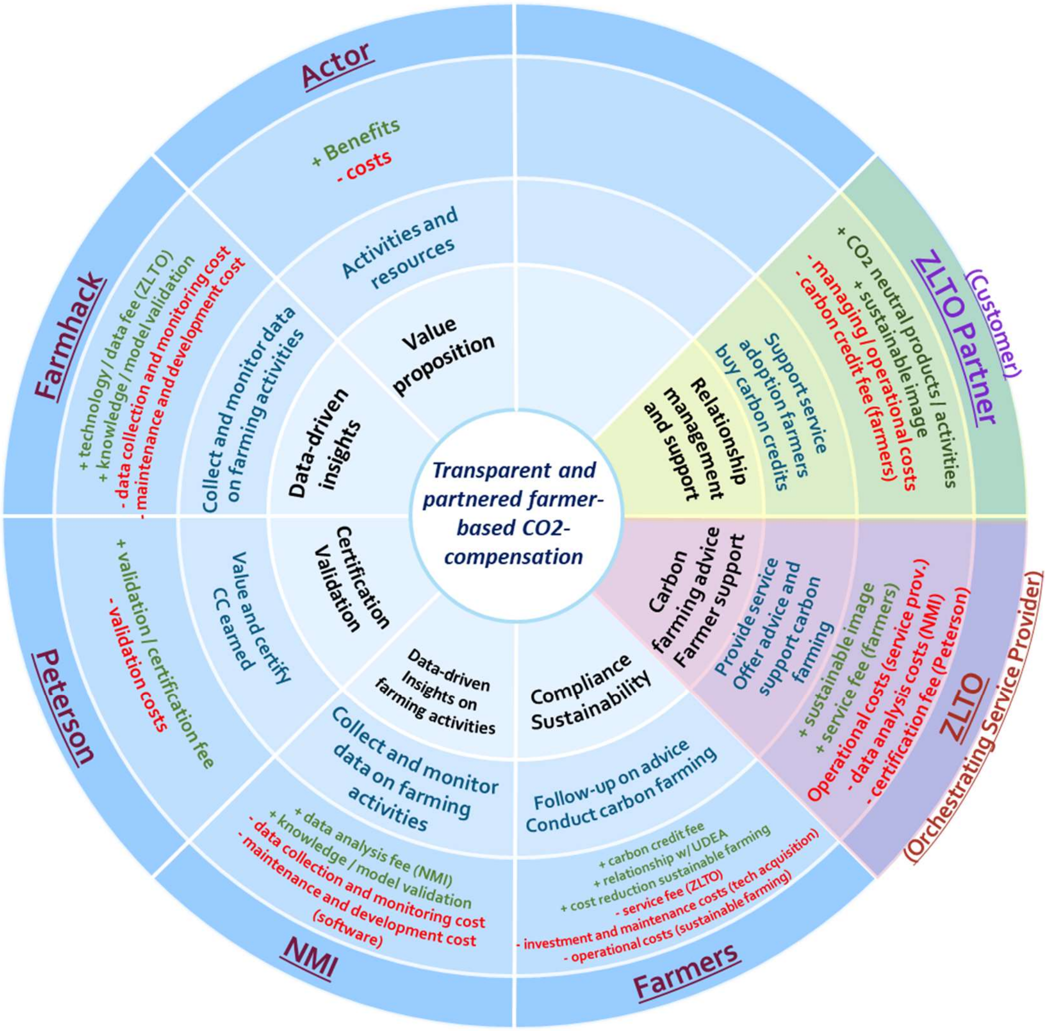

Figure 24 – Business model design for SIP 8

3.9.3 Impact logic

To explore the underlying assumptions and challenges for the business model design drafted for SIP 8 and to understand how the business model design is to be scaled over time, benefits realization mapping (BRM) is used. The BRM for SIP 8 is illustrated in Figure 25. One can see that the carbon sequestration platform / service enables the farmer to receive advice on carbon sequestration activities / sustainable farming. To do so, data is collected at farm appliances by Farmhack, but also requires data to be entered by the farmer as well as periodical soil sampling by ZLTO. Logically, this calls for support in terms of sensors to collect data (Farmhack) as well as available personnel (ZLTO) to do so, which should be considered for business model implementation. Based on the advice and application of carbon sequestration practices, carbon credits can be earned by farmers. This requires farmers to follow up (long-term) on the advice given. Here, support should be given to the farmers to do so. This is to be conducted by the ZLTO partner (e.g., UDEA) (which allows the partner to strengthen its relationship to its farmers) as well as ZLTO. The generation of carbon credits also depends on the validation of the process to earn carbon credits. This validation is conducted by Peterson, verifying that the process adheres to European agreements on carbon credit specification.

The carbon credits earned are purchased by the ZLTO partner (e.g., UDEA) or sold on the open market. In the case of a fixed purchaser (the ZLTO partner), this should be contractually agreed upon with the

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farmer, determining the price for which the carbon credits are to be bought as well as the length of this collaboration. Purchasing the carbon credits helps the purchaser in decreasing its CO_2 footprint. Logically, the farmer will receive a financial compensation in return. This compensation should not be considered as a means to generate significant revenues: it is an incentive for farmers already interested in becoming sustainable. This collaboration between the ZLTO partner and the farmer is also expected to contribute to the relationship between both stakeholders, aimed at co-creating value to achieve CO_2 neutral, biological products for consumer markets.

For the farmer, using the service also contributes to its soil performance (which is expected to improve its produce quality and yield over time). This can help in achieving sustainable farming practices for Dutch farmers, which is in line with the goals of ZLTO. However, this does call for significant scaling of the current amount of farmers involved. This requires ZLTO to scale as well and to attract other retailers or projects interested in buying carbon credits as well as farmers to do so.

3.9.4 Strategic implications and challenges faced

The business model design has several strategic implications as well as some business challenges. For the farmer this business model means they will have to look differently at the way they farm in the long term, which creates a sort off lock-in situation. Carbon sequestration takes place over a longer period of time. Even when a farmer wants to stop this business model, they are still expected to maintain the efforts already conducted.

The ZLTO partner that purchases the carbon credits will step into a longer term relationship with different farmers and be open and accountable to both the farmer and the general public. This requires a transparent operating model.

ZLTO will provide advice to farmer on how to store carbon. However, the platform and technology used store and measure carbon sequestration is not the core of ZLTO knowhow. This means ZLTO will have to continue working with partners like NMI and Farmhack but also obtain (more) knowledge on these technologies as well.

This business model design requires NMI to ensure the current service can be performed more efficiently. That means structural investment in the technology and the business model.

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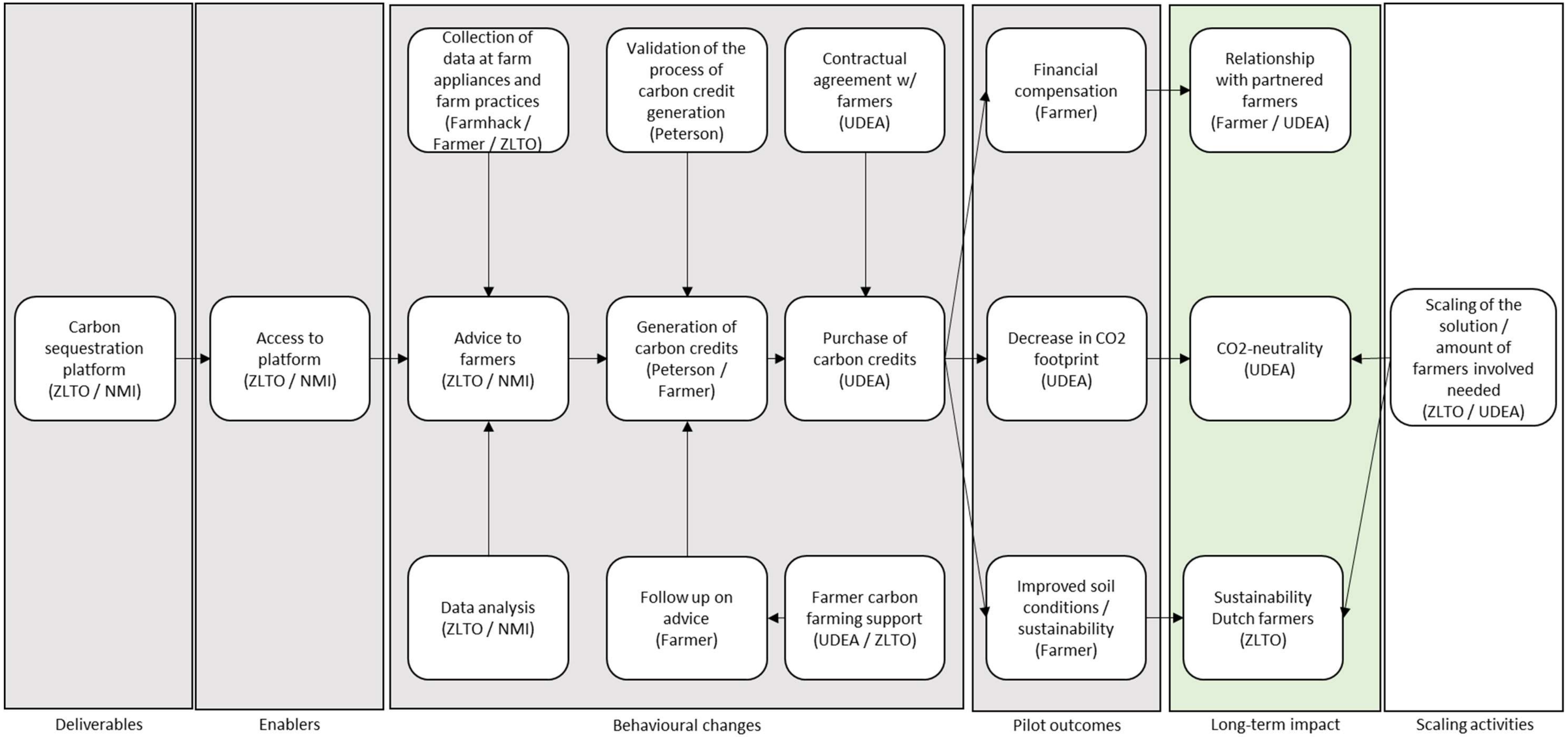

Figure 25 - Impact logic for SIP 8

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Business challenges faced

Scaling of the solution is dependent on several factors. In terms of financial barriers, the service currently suffers from significant administrative costs, making it difficult to provide an attractive cost-benefit perspective. Subsidies or investments (banks) could potentially reduce this, as well as further developments for the model (automating steps further).

With regards to technological challenges, it is difficult to quantify the long-term effects of the service, both in terms of carbon stored (how long does it remain stored?) as well as the effects on the soil (potential improved product quality). Here, also legal issues may arise, at is currently not clear how carbon capture is defined (under what conditions how long should it take place for carbon to be considered as 'stored').

As farmers increasingly become sustainable, the effects become less in terms of carbon sequestration. Ultimately, this means that the BM will cease to exist once farmers have optimized carbon storage for the soil.

3.9.5 Next steps

SIP 8 (ZLTO) recognizes that the current carbon farming platform developed as part of Ploutos does not match with the capabilities and type of activities ZLTO typically conducts: it represents a move from a orchestration and knowledge provider partner towards a service provider for farmers in the Netherlands. Acknowledging this, SIP 8 is in the process of identifying relevant partners to which the carbon farming platform can be transferred, after which ZLTO can move into a supporting role to connect farmers to the platform and to provide additional support where needed (more closely related to its original business strategy). The collaborative business model designed as part of the SCBMI approach helps in determining the characteristics and capabilities needed for such a partner, as well as clarified the interrelationships between partners such as NMI, Farmhack and Peterson needed to support the solution in practice.

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3.10 SIP 9 – FoodShare

3.10.1 Solution and value proposition

The solution central to SIP 9 is a web-based application that is made as a platform to connect agriculture holdings, supermarkets and other food producers and distributers with end users recipients (charity organizations). It utilizes all the technological enablers of a sharing economy, including data analytics and artificial intelligence and connects them with an intuitive UI/UX design that engages users with limited familiarization to digital platforms, such as farmers and consumers.

The value proposition statement of SIP 9 reads as follows: Our foodshare platform facilitates the transfer of surplus food from food producers (farmers, industrial producers, retailers, etc.) to charity organisations by aligning logistics and processes. Therefore, the foodshare platform helps food producers avoid surplus food ending up in landfills while providing food to charities and socially disadvantaged groups.

3.10.2 Business model design

The business model design which emerged through the SCBMI process for SIP 9 is illustrated in Figure 26. The central value-in-use is reduced food waste through a foodshare platform. The customer / end-user of the business model design are **charity organizations**, who indicate need for food through the platform and in that way contribute to sustainability. They benefit from this through social support and as such they have to put effort to receive the food donations.

The FoodSHare platform is active in two Balkan countries - Serbia, where it is managed by **Foodscale Hub** (SIP9 leader); and North Macedonia, where it is managed by **Green Growth Platform** (SIP partner). FSH and GGP operate the platform and provide support to the platform users. Platform is currently free to use and is financed through the Ploutos project.

Food producers (donors) contribute to sustainability by offering their surplus food products to charity organisations on the FoodSHare platform. By doing so they put effort in posting their donations on the platform, food distribution, etc. On the other hand, the main benefits for food producers are: CSR activities (they portrait themselves as being socially-responsible) and reduction of food waste and reduction of costs related to the destruction of food waste.

Volunteers assist the facilitation of the platform by supporting collection and distribution of goods. They benefit from additional social support and put effort for food distribution and collection.

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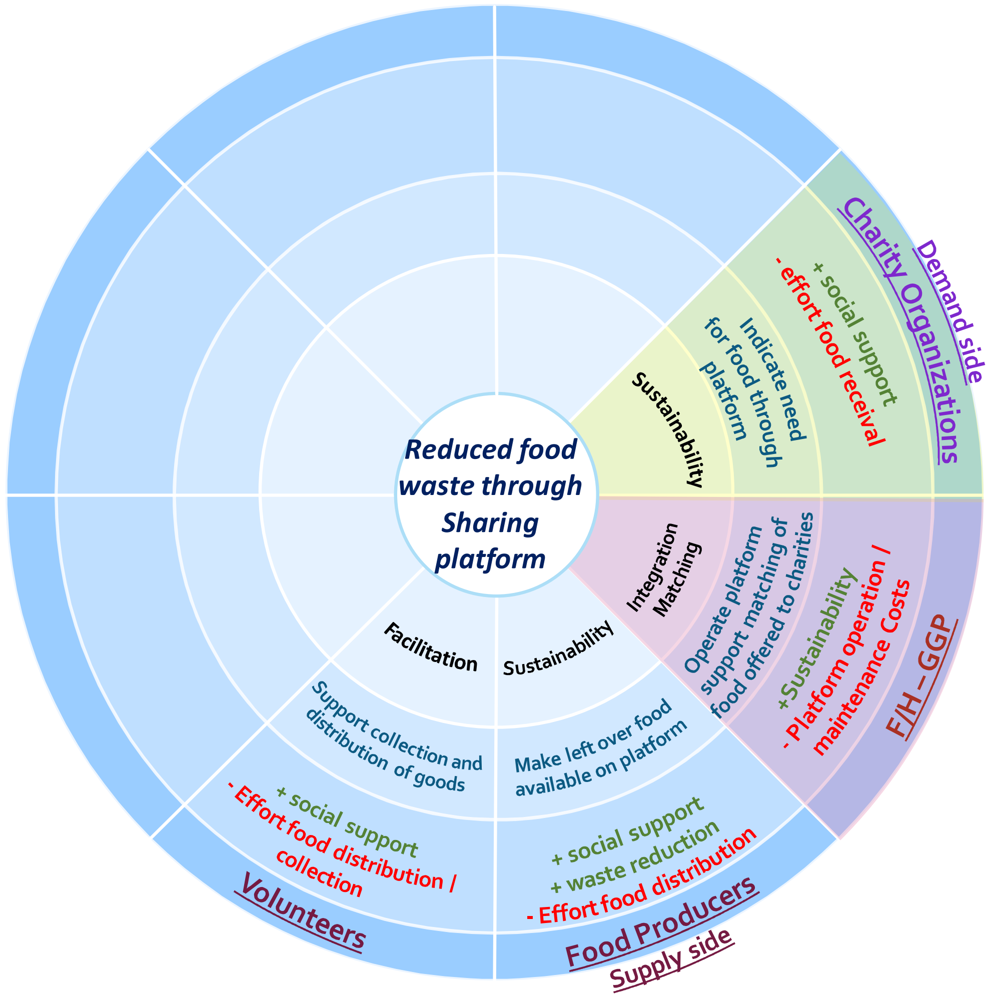

Figure 26 - Business model design for SIP 9

Currently the orchestrators FSH and GGP are relying on their own limited capacities in terms of income to offer and keep the platform and solution running, this can pose a challenge in the long term if scaling happens. Therefore, during one of the workshops it was explored which business model variant in the future could remedy the scaling challenge. In Figure 27 the preferred variant is illustrated, here FSH-GGP will license the platform to other partners (note that these partners could also be food producers themselves). These in turn can then use the platform under their preferred name and come in contact with the end-users (charities) who are interested in receiving the leftover food. For this license a commission fee is paid to FSH-GGP to operate the platform.

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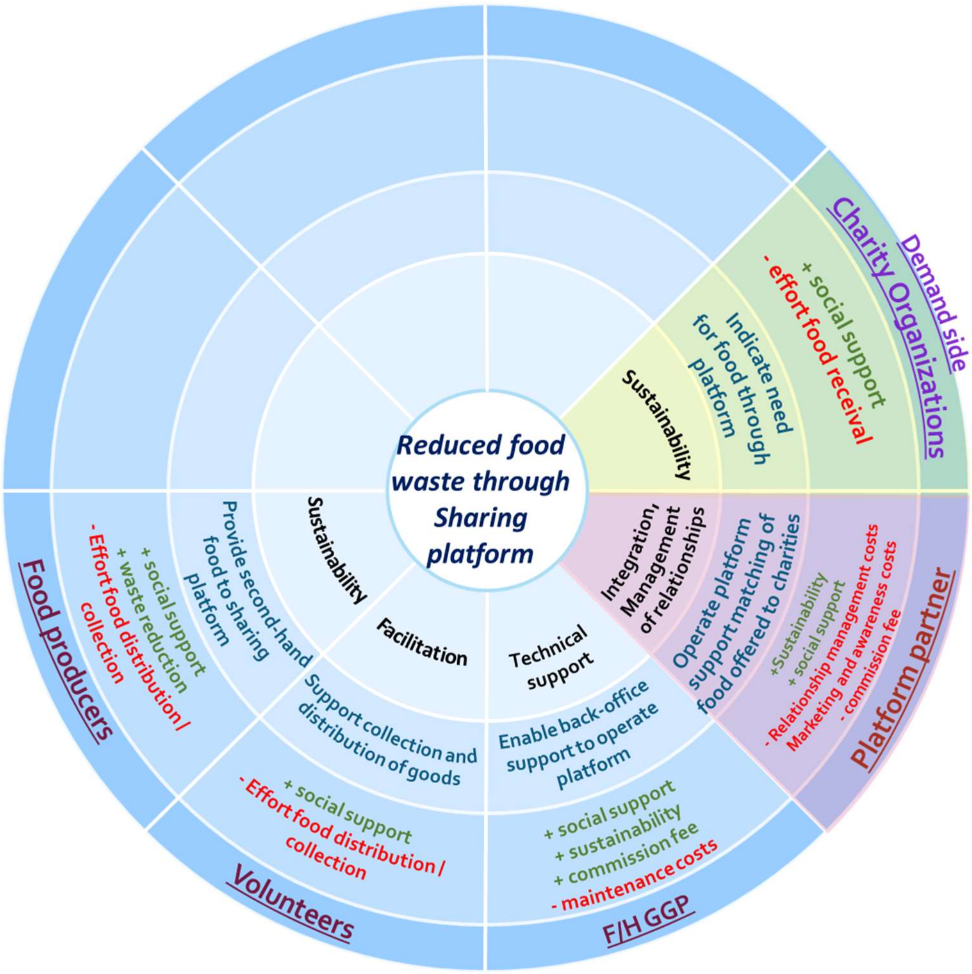

Figure 27 - White-label alternative business model design for SIP 9

3.10.3 Impact logic

Based on the business model design, the impact logic for SIP 9 was drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 28. The deliverable for SIP 9 (a Food Share platform) enables encouraging and linking of food donations to charities.

Charity organizations and food producers indicate if they are interested in receiving or giving donations respectively. This indication happens on the platform that is operated by FSH-GGP, they in their turn analyze the amount of demand and supply. Once a linking between donator and receiver is established FSH-GGP contacts volunteers if needed to ensure collection and distribution can take place. The outcome of this solution is reduced food waste and support for people in need. By this the intended impact that SIP 9 wants to achieve in the long term is increased social support, less food waste and promotion of corporate social responsibility among food producers.

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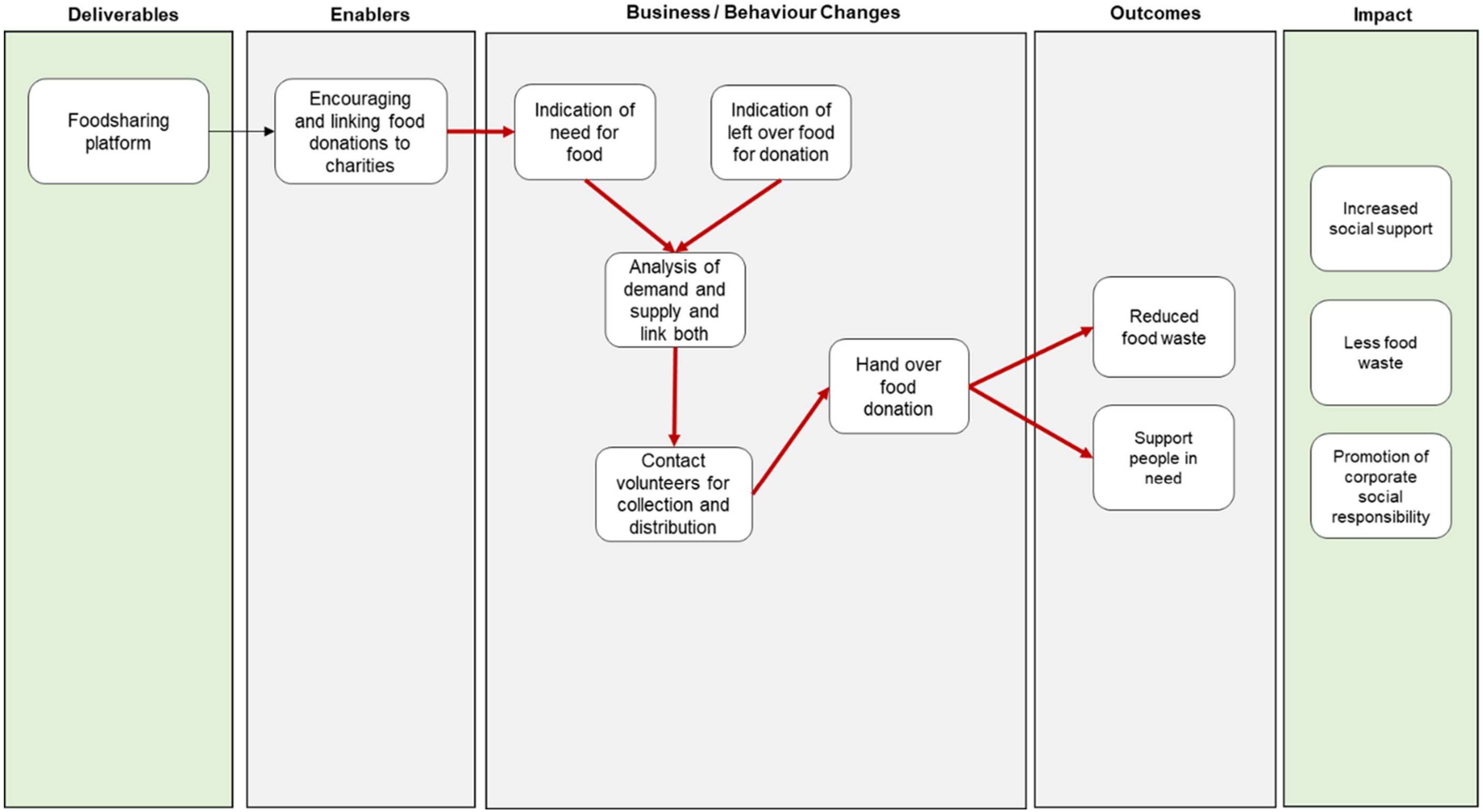

Figure 28 - Impact logic for SIP 9

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3.10.4 Exploitation plan for SIP 9

In collaboration with stakeholders for SIP 9, we identified that the objective for the SIP is to understand how current activities can be scaled to generate additional (sustainable, social) impact. The food sharing platform currently is operable and is being used to match surplus food to charities in need. As donations are already taking place, sustainable and social impact is being achieved but there are still challenges faced to scale these operations. SIP 9 indicated that it would like to delve further into the opportunities to scaling as well as the concrete actions that should be taken to realize these scaling intentions. To this end, as part of the ad-hoc part of the SCBMI approach, we developed an implementation plan in collaboration with the SIP to help them structure the process towards scaling.

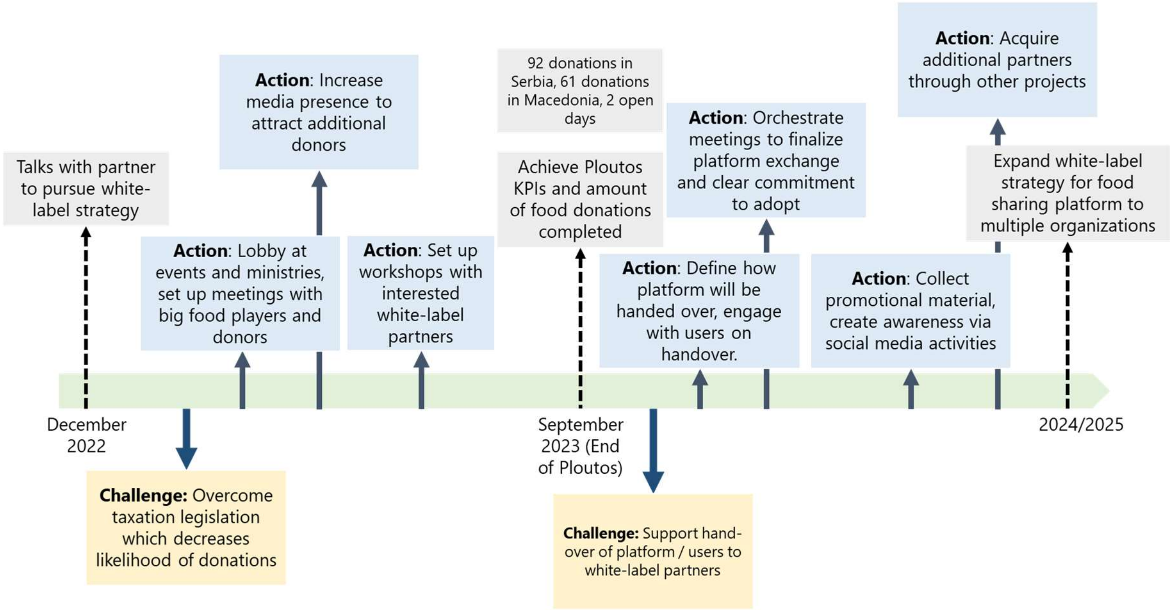

Figure 29 - Implementation plan for SIP 9

The implementation plan for SIP 9 is illustrated in Figure 29. Through discussions with SIP 9 as part of the design and evaluation phase for the SCBMI approach, we identified that a *white-label strategy* (i.e., SIP 9 becomes a platform, technical service provider for a large non-profit organization which manages the matching and exchange of donations) was considered as the most promising opportunity to scale the food sharing business model. The white-label strategy enables SIP 9 to continue its activities of supporting the food sharing platform (contributing to sustainable and social impact) and can contribute to scaling efforts *without* the need to scale their internal activities (it can support the technical scaling of the business model with more or less the same number of people currently involved and does not have to invest additional time for interacting with donors or recipients). It also enables SIP 9 to identify partners which share similar values – SIP 9 can therefore drive the selection with whom to collaborate, allowing SIP 9 to safeguard that the food sharing platform is used as originally intended to.

This white-label strategy poses two main challenges: on the one hand, partners should be identified that are interested in adopting the food sharing platform as a service and orchestrating the exchange of food between donors and recipients. This involves transferring the food sharing service to these partners and ensuring that these can be operated by partners (with the technical support of SIP 9). This also involves migrating current users to these partners, meaning that these users should be informed and should be motivated to do so. Another challenge faced for scaling the food sharing platform is the fact that as a result of current legislation in Serbia and North Macedonia, incineration

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or disposal of surplus food is often *preferred* over donating surplus food. This is due to the fact that donations are taxed and as such are often more expensive than throwing away. To scale the amount of users, this legal barrier should be overcome.

We can see that for the end of Ploutos, SIP 9 intends to realize its objectives in terms of supporting the amount of donations achieved and orchestrating open days to support communication on the food sharing platform. It also wants to tackle the problem of legislation that is currently hindering the scaling of the food sharing platform. To do so, concrete actions are defined to:

1) Lobby at the relevant ministries to overcome tax policies for donations of food.
2) Set-up workshops, interviews and discussions with interested partners to transfer the platform (and facilitate scaling) have been defined.

Post-Ploutos, the transfer of the food sharing platform to partners should be realized (in line with the white-label strategy). Concrete actions defined here are to:

1) Define how the platform will be handed over and when, and how users can be involved for this process to onboard them for this migration.
2) To collect promotional material on previous successes as part of the food sharing platform to attract additional partners to further scale the impact of the food sharing platform (i.e. to be able to transfer the platform also to other partners, enabling an increased access to donors and recipient).

It is the goal of the SIP 9 to realize this white-label strategy in 2024. From that point onward, it will act as a technical service provider for the food sharing platform, with the key role to support the partner in maintaining the food sharing platform and driving the communication of the platform to other key stakeholders. The actions defined help the SIP to streamline the next steps to take to achieve this.

3.10.5 Next steps

As also illustrated by the exploitation plan, the next step for SIP 9 is to overcome taxation and legislation barriers for food donations and to create traction and awareness for the food sharing platform, such that suitable partners for transfer and scaling of the platform can be identified. Concretely, it will plan meetings with interested partners to discuss the terms of conditions of a potential transfer of the platform. It will also set up a workshop with government stakeholders to stress the importance of the food sharing platform in contributing to societal and environmental challenges faced in Serbia and North-Macedonia. With these actions, SIP 9 hopes to move towards a more suitable climate to grow and scale the food sharing platform.

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3.11 SIP 10 – Grapevine Carbon Credits

3.11.1 Solution and value proposition

SIP 10 focuses on providing a Decision Support System (DSS) to *vineyard farmers in Italy*, through which farmers receive advice and support on how to *sustainably improve their farming practices*. To do so, farmers are required to enter data on their farming activities for the DSS. On the basis of this data, the DSS is able to generate advice to help farmers improve on their farming activities. This can benefit farmers through *reduced fertilization and water* needed as well as *increased operational efficiency*. The DSS solution also enables farmers to translate carbon reduction as a result of service use into carbon credits which can be sold on associated platforms. Therefore, use of the DSS solution may also generate financial revenue for farmers.

The DSS-based solution is coupled to a parametric insurance service that provides *financial protection* to farmers in case of adverse weather conditions. The advantage of this insurance service over regular insurance services is the fact that through parametric models an *increased speed* of payment can be achieved, which in turn benefits the farmer through *decreased risk*.

3.11.2 Business model design

The business model design which emerged through the SCBMI process for SIP 10 is illustrated in Figure 30. The central value-in-use offered by means of the 'package of solutions' is *sustainable and financially protected management of farming practices*. The customer / end-user of the business model design are the **vineyard farmers**. Through use of the service, they are able to generate the following costs and benefits:

- Increased insights / knowledge on their farming practices
- Reduced production and operations costs
- Increased revenue through premium prices of produce that can be achieved
- Decreased risk due to quicker insurance payments
- A subscription fee to the use the solution
- Insurance fee as part of parametric insurance contracts
- The need to follow up on advice given, reducing farming flexibility

The solution is offered by **Horta** which acts as the orchestrator of the business model design. As orchestrator, Horta:

- Enables insurers to provide their services through the DSS platform
- Collaborates with farmer's associations to support the use of the DSS service
- Collaborates with CETIF to connect insurers to platform / enables CETIF to connect its platform interface for insurers
- Connects the DSS service to carbon credit platforms such that carbon credits can be sold
- Ensures that carbon credits are validated / certified through certification partners

Farmers pay a subscription fee to Horta to use the DSS solution. Through DSS service use, reduction on pollution / environmental sustainability is expected to be achieved which is deemed valuable by Horta. Horta also uses the platform to generate knowledge on how agricultural models used can be improved. Horta incurs costs related to operating and maintaining the platform as well as operational costs with regards to generating advice for farmers / connecting farmers and insurers to the platform / maintaining agricultural models. It also incurs costs related to the validation / certification of carbon credits earned.

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Insurer(s) are responsible for offering *timely financial protection*. They benefit for the business model design through expanding their portfolio and increasing the efficiency of handling insurance claims (which through the data collected for the DSS can be largely automated). The insurer(s) logically pay out to farmers in case (valid) claims occur and pay a service fee to CETIF for connecting insurers to the platform (particularly if insurers lack a platform-based interface). Operational costs related to handling insurance claims can be expected.

The farmer's association is involved as a stakeholder to support the adoption of the DSS-based solution. This can include clarifying to farmers how data is used as well as supporting the training of farmers to use the DSS as part of their services to farmers. Through business model participation, the farmer's association generates (collective, data-driven) knowledge on the farming practices of its farmers. It is also decided that the efforts on carbon farming and carbon credits at the individual farmer level are aggregated at the association level. Farmer's associations therefore handle carbon credit sales, through which they generate revenue. This revenue is then reinvested to provide additional services to farmers part of the association. Operational costs (related to supporting training of farmers) as well as validation costs (stimulating the adoption of the DSS by farmers) are expected.

CETIF supports the networking and integration of insurers for the DSS based solution. It also provides the models for the parametric insurance service. For connecting insurers to the Horta platform, CETIF receives a service fee. In addition to this, CETIF benefits from participation in terms of visibility as an insurance service provider as well as generates knowledge on the validity of the parametric insurance models. For CETIF, operational costs are expected to connect insurers to the Horta platform, whereas development costs for the parametric models used are expected.

Carbon credit platforms are involved as the outlet for carbon credit sales. Interested buyers belonging to a platform (or project interested in carbon credits) can purchase carbon credits generated by farmers through this platform. For these buyers, the main benefit is the CO_2 compensation that can be attributed to purchasing carbon credits (at the expense of a carbon credit fee).

Certification partner(s) are involved to demonstrate the validity of carbon credits generated through the DSS use, such that sustainability claims can be build upon purchasing carbon credits. The certification partner(s) receive a fee from Horta for doing so, and generate operational expenses in terms of periodically checking whether the data entered for the DSS is correct.

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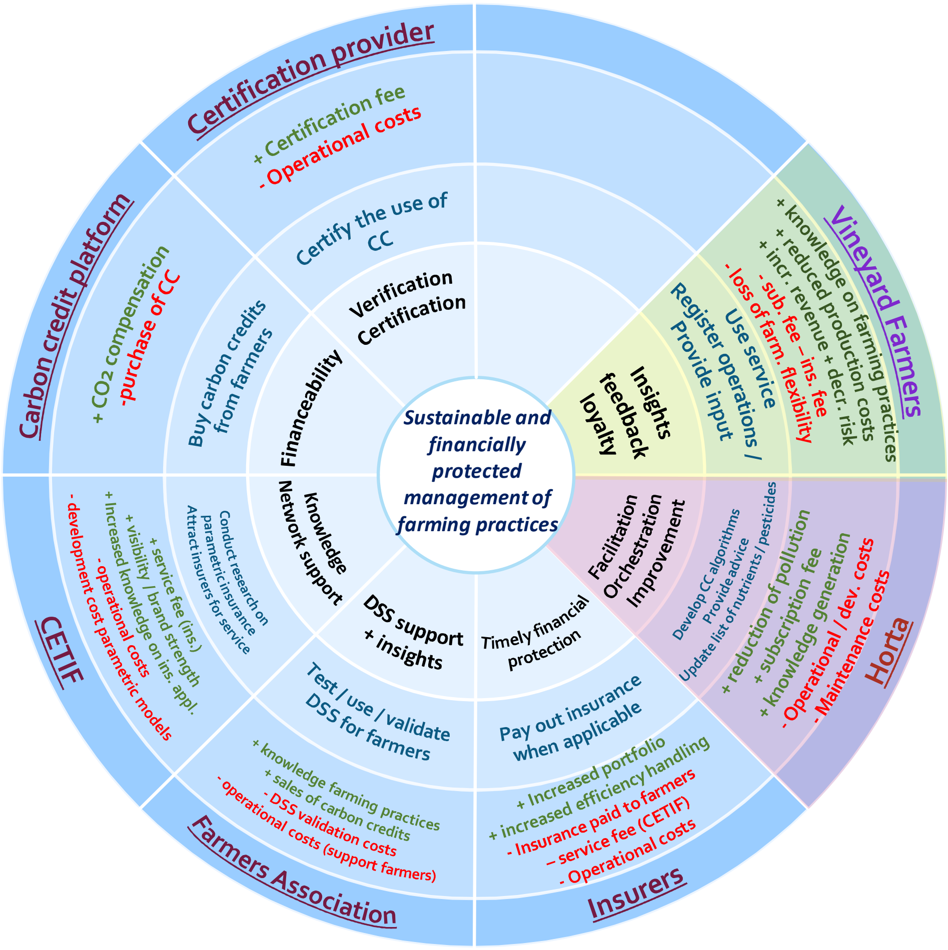

Figure 30 - Business model design for SIP 10

3.11.3 Impact logic

Based on the business model design, the impact logic for SIP 10 was drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 31. The deliverables for SIP 10 (DSS-based service, carbon credit platform access and parametric insurance service) enable farmers to receive insights on their farming (crop) performance, to sell carbon credits and to reduce their risk / automate payment for insurance claims in case of adverse weather conditions (meaning that if the model is followed but the yield is less than expected, compensation should occur). In the following, we first elaborate on the DSS-based service, after which the parametric insurance is discussed.

To generate the advice, data on farming practices has to be entered periodically by the farmer. Here, training is required given by Sette Colli (the farmer's association) and Horta to help the adoption of the service. Given the current scope of activities for both parties. No challenges or barriers are expected here: it is expected that the collaboration between both parties contributes to the required trust of farmers in using the technology and sharing data. Horta indicates that the farmer remains owner of the data.

Based on the data, Horta generates advice to the farmer. To do so, Horta should continuously operate and maintain its platform-based solution and refine its prediction models using the input of the farmer(s). To generate sustainable outcomes, farmers are required to adopt the advice that is given, meaning that a degree of compliance is needed. It is indicated that the advice provides degrees of

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flexibility in terms of crop management: farmers are free to make other choices than specified by the DSS-based solution.

Through (sustained) use of the DSS, carbon emissions can be reduced, which can be transformed into carbon credits that can be sold. Carbon credits take time to accumulate as they represent the *delta* between current and past carbon emissions. To generate carbon credits, the support of certification partners (such as Peterson, also involved in Ploutos) is needed. Consequently, through access to the platform, the carbon credits are sold. This task is executed by Sette Colli which collects carbon credits at the individual farmers and sells these in bulk to the platform. The revenue generated is used to provide additional services to its farmers. Logically, without a project or platform interested in buying carbon credits, this activity cannot take place. It should be noted here that the value of carbon credits is still volatile as well as their legal conceptualization is still immature: prices of carbon credits can fluctuate significantly, especially in for the future. Next to this, European policy makers are still defining under what conditions a carbon credit retains its value (e.g. how long should carbon be stored, how should it be measured?). This can influence the value that can be created through the platform.

Through use of the DSS, the farmer is expected to reduce its resources needed (fertilization, water, pesticides) which translates into financial savings long-term. This also contributes to improvements for the soil quality which has sustainability benefits over time. Lastly, it is expected that the product quality will increase as a result of DSS use. This would allow farmers to target premium prices, although it should be validated what gain can be expected from this.

For the parametric insurance, contracts have to be defined between selected insurers and farmers. The Horta platform allows many concurrent insurers to be active for the platform, enabling farmers to select the insurer(s) that work for their specific situation. Logically, these insurers should first be connected to the platform before this can start. It should be noted here that the legality of these contracts is still being explored: currently the rules and policies in Italy do not fully accommodate and support the definition of parametric based insurance contracts. As a consequence, this can have significant impact on the roll-out and timing of deployment of this service. To support contract definition, the input of parametric insurance models is needed (to be provided by CETIF). It is indicated here that farmers do not always understand *how* the models work: whilst the value of the models is clear (timely payments), it is not clear how and what data is used. This could hinder the adoption of the service.

Once the contracts are set and the models are in place, the analysis and (potential) automated payout of insurance claims can take place. Here, data on farming activities collected by Horta is used: if farmers followed the advice given by Horta (taking into account the available degrees of freedom) and end up with an actual yield lower than the expected yield (often the result of poor weather conditions) the difference is compensated by insurers. This serves as a risk reduction or 'pillow' for farmers.

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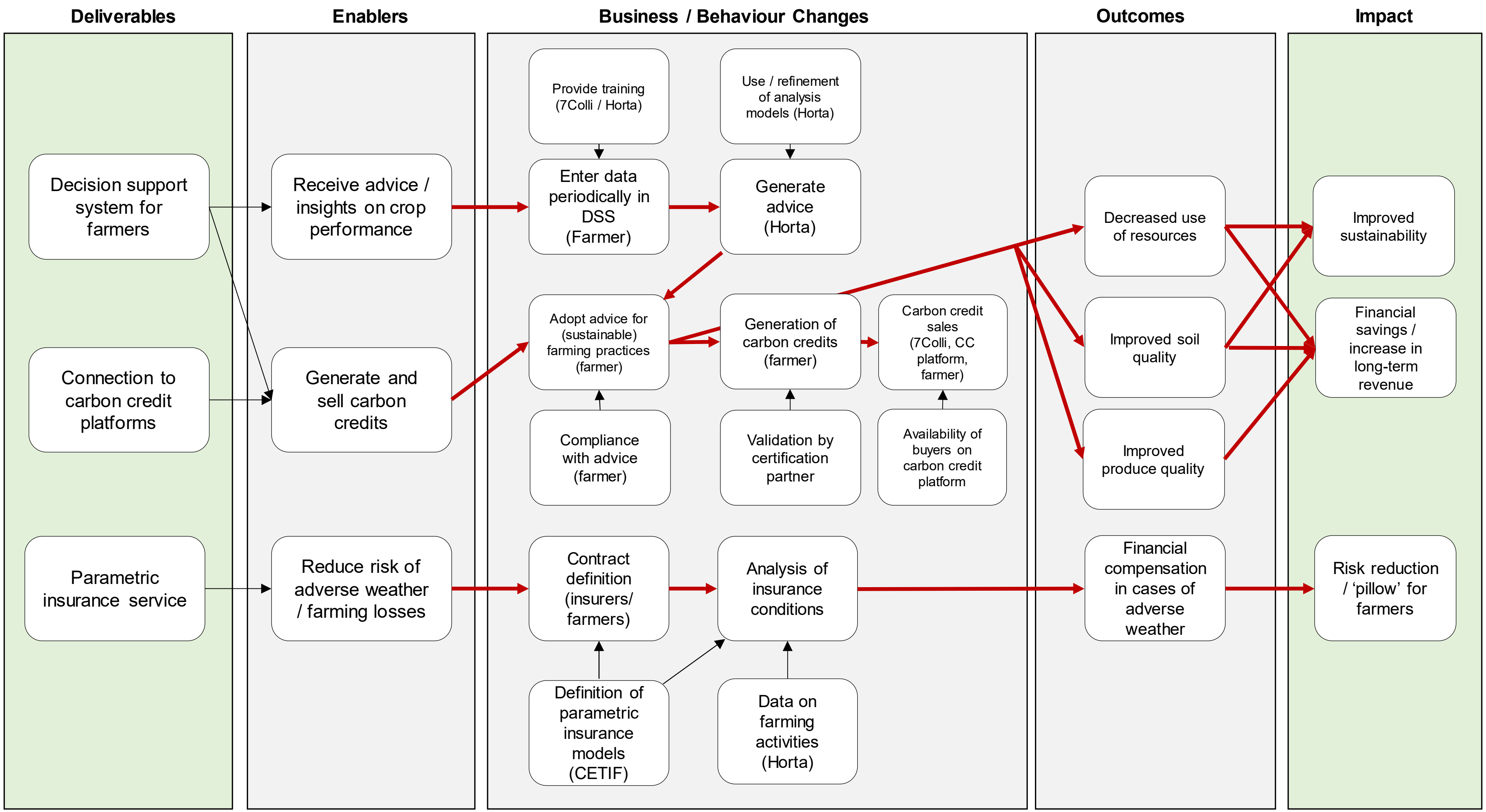

Figure 31 - Impact logic for SIP 10

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Horta intends to scale the solution for farmers in Italy and neighboring countries. Effects such as cultural differences as well as climate differences should be taken into account to do so. This scaling intention also requires Horta to scale internally: the current human and financial capacity is not yet sufficient. In terms of the parametric insurance service, scaling of the solution depends on the amount of insurers that can be connected for the platform. Again, cultural differences as well as climate differences can influence the risk profile for insurance contracts: this should be taken into account for attracting insurers.

3.11.4 Strategic implications and challenges faced

The business model design has several strategic implications as well as still has some business challenges. For Horta, this business model requires strategic repositioning from a traditionally technology provider perspective towards a (platform-based) service provider, integrating the services of concurrent actors for their DSS / Horta platform. This enables Horta to provide more holistic services to farmers, but also requires Horta to develop orchestration capabilities to be able to integrate different services of different providers.

For CETIF, the business model design also calls for strategic repositioning: the parametric service may call for platform-based service through which the service can be accessed, particularly if insurers lack these capabilities. In such cases, CETIF will act as a *service provider* rather than a knowledge provider. This requires CETIF to organize how these services will be offered, as well as calls for long-term support on operating and maintaining such services.

For insurers, the prime motivation to pursue collaboration with the Horta platform is the fact that it opens up the opportunity to provide different insurance products. Data collected through the DSS enables insurers to offer specialized insurance services which previously (in traditional settings based on ad-hoc insurance claims) were not possible. The automated payment structure also can significantly reduce handling costs for insurers.

Business challenges faced

The DSS-based solution can create a lock-in for farmers depending on how the insurance contracts are defined. Without use of the DSS, the insurance services cannot be operated, meaning that farmers *are required* to use the DSS for as long as the insurance contracts are in place. Farmers should fully understand how the data is used and by whom this data is used. Horta (as the party in which the trust of *using* the data is placed) should ensure this trust is justified. Without clarity on how data is used, adoption of the DSS based service will be difficult.

Carbon credits are still maturing, meaning that over time the conditions for earning carbon credits can change, potentially increasing or reducing the value that is created for the farmers through the DSS use. It should be explored what this means over time for the farmer, particularly since carbon credits take some time to be accrued.

3.11.5 Next steps

To support the further concretization of the business model, strategic decision making at Horta and CETIF should take place to commit resources towards deployment past the pilot phase. Therefore, the next steps for these organizations is to create internal commitment to commit resources and manpower towards the deployment and roll-out of the solution in practice. This involves communication of SIP stakeholders of business model results to their respective management.

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3.12 SIP 11 - AgriTourism

3.12.1 Solution and value proposition

SIP 11 proposes a smart farming based solution (the so called 'NADIA' platform) to support *farmers* in Mallorca to generate data-driven insights on their farming practices, with the aim to help farmers in becoming more sustainable and to reduce the use of resources such as water, pesticides and fertilizer. The smart farming solution leverages sensors that are installed at the farmers (greenhouses) to collect data on important cultivation characteristics such as the temperature and humidity and to make insightful how well the crops are performing. Based on these insights, decision making by farmers can be supported. The system also provides alarms or handholds for farmers to further support farming practices. All in all, the smart farming solution is intended to help the farmer become more sustainable. In addition to support the farming practices of farmers, the data that is collected can also be used to connect agricultural practices to sectors such as tourism. As part of SIP11, the smart farming solution therefore is also to used to create transparency / traceability on farming practices and to make this explicit to tourism service providers / enable tourism service propositions such that tourists (interested in experiencing agriculture on Mallorca or indulging in sustainable farming activities or outputs) can be attracted. The value proposition of the smart farming solution is therefore two sided: on the one hand, it supports farmers in becoming more sustainable, whereas on the other hand it may enable farmers to connect sustainable farming practices to agri-tourism service propositions.

3.12.2 Business model design

The generic business model for SIP 11 is illustrated in Figure 32, which captures the type of stakeholders involved to support a agri-tourism proposition. The central value-in-use offered by means of the solution is *sustainable, comfortable agri-tourism on Mallorca*, emphasizing the use of data collected through the smart farming service and re-using this data in such a way that tourism-focused service propositions can be enabled. The customer targeted by means of this business model design is the **agri-tourist**, particularly those that are interesting in experiencing or partaking in sustainable farming practices. The agri-tourist is able to generate the following costs and benefits through this business model:

- Sustainable tourism, benefiting from experiencing and contributing to sustainable (farming) practices
- Social value (for farmers), supporting local solutions as part of tourism activities
- Fee paid for the service proposition to engage in agri-tourism
- Additional expenses that are made as part of the tourism experience

The orchestrator in this business model design is **Anysolution**, responsible for integrating the business network (acting as the SIP leader) and support the generation of data-driven insights based on farming practices. As explained, on the one hand, this can contribute towards increased sustainable farming practices for farmers; on the other hand, this data can be used to connect farming practices to tourism activities. Anysolution is responsible for the development, installation and maintenance of the smart farming solution (NADIA). As a result, costs are incurred related to the development and maintenance of the smart farming service, whereas costs are also incurred in regards to installing and maintaining sensors used. In return, Anysolution is able to capture part of the tourism fee that is generated (depending on the extent to which Anysolution was involved for shaping the agri-tourism experience for a given customer). In addition to this, Anysolution also receives a fee from the farmer to use the smart farming service.

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The business model design is complemented by the stakeholders **tourism service providers, COOPBAL, Farmers** and **Agromallorca**. **Tourism service providers** are involved to provide (support for) tourism services such as accommodation, transportation and catering. In contrast to typical tourist services for Mallorca (focused on summer holidays and beach activities), these tourism service providers incorporate explicit agricultural activities and products in cooperation with Agromallorca, COOPBAL and farmers. As a result, the service propositions offered by tourism service providers are catered to the needs and preferences of agri-tourists. For orchestrating and arranging service propositions to agri-tourists, these service providers capture part of the sustainable tourism fee that is paid. Logically, for arranging the trips for agri-tourists, operational and maintenance type of costs are expected.

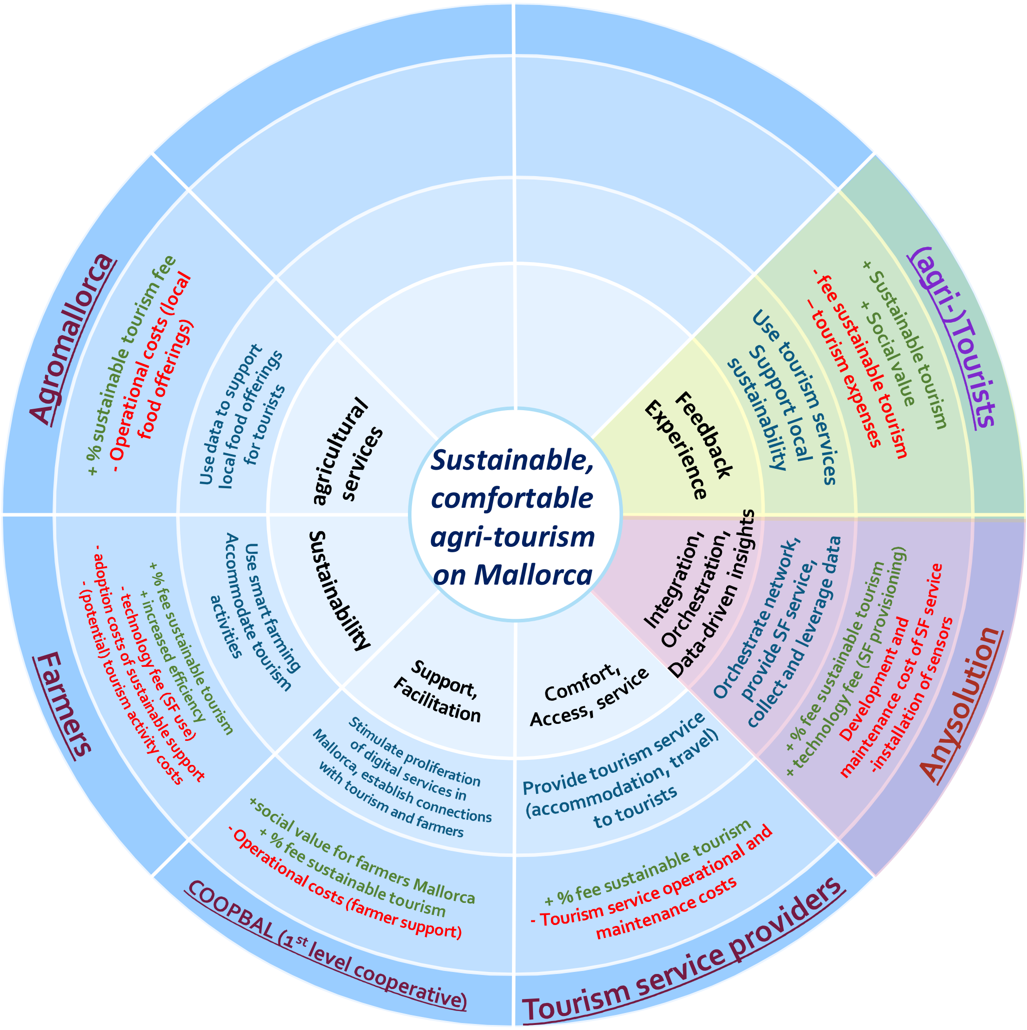

Figure 32 - Business model design for SIP 11

COOPBAL (the 1st level cooperative of farmer's cooperatives in Mallorca) is involved to stimulate the proliferation of digital solutions towards sustainability for Mallorca. Their role is to make explicit what value can be generated through the use of digital solutions and how it can help farmers in achieving sustainable business practices. Additionally, COOPBAL has an important role in linking agriculture to tourism activities. As benefits, COOPBAL is able to benefit through the business model design from sustainable farming practices at farmers if farmers adopt digital solutions. In addition, depending on their role for providing service propositions to agri-tourists, they may be able to capture part of the sustainable tourism fee that is paid (for example in working together with the farmer to orchestrate

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on-site activities). In terms of costs, COOPBAL incurs operational costs related to promoting digital farming services in Mallorca.

The **role of the farmer** is to contribute towards sustainable farming practices through use of the smart farming service. In addition, data collected through smart farming use can be used to enable or support additional service propositions to agri-tourists (for example, to use data on the blossoming of almond trees to provide on-site visits to tourists). Through use of the smart farming service, the farmer is able to benefit from increased efficiency / improved sustainability of its farming practices. In addition, depending on its role for providing service propositions to tourists, it is able to capture part of the sustainable tourism fee. As costs, the farmer pays a fee to use the smart farming service. Additionally, it is required to adopt the service and integrate it as part of its common farming practices. Lastly, costs may be expected in regards to supporting tourist activities (for example, organizing activities on-site).

Agromallorca is involved to support the offering of additional (agriculture based) services to tourists. For example, the data collected by the smart farming solution can help in communicating a sustainable and local story for products sold by Agromallorca, which can enable Agromallorca to strengthen its claims or to achieve premium product fees. Through use of the data collected by the smart farming service, Agromallorca is able to benefit from part of the sustainable tourism fee / expenses made by tourists when visiting the island. As costs, Agromallorca incurs operational costs (selling and packaging locally produced food offerings).

Business model variants

Through collaborative, on-site workshops with stakeholders on Mallorca, several variants regarding agri-tourism propositions for the island have emerged, demonstrating the use of digital innovations to support new (agri-tourism) value propositions. These business model variants are illustrated in Figure 33 and Figure 34.

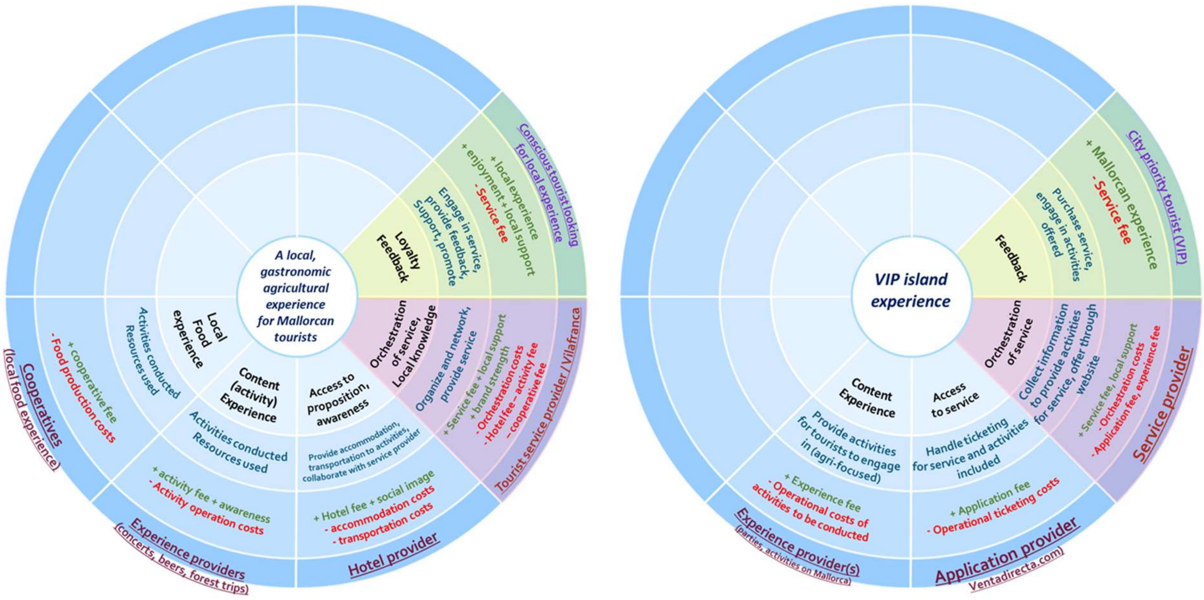

Figure 33 - Business model variants for agri-tourism identified through on-site workshops

Once can see that the business models all deal with providing a central-value-in-use which captures the essence of agriculture in Mallorca to tourists, although different configurations for the business model design are selected. The business models depicted in primarily reason from providing activities in the context of agriculture, such as farm visits, hikes or other nature experiences. Here, the farmer

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directly (as a service provider) or indirectly (through channels such as the hotels at which tourists tend to start their journey) offers activities to tourists to take part in, whilst they can enjoy their time at the farm location of the respective farmer. To provide such services, experience providers (i.e. parties with capabilities geared towards providing activities such as beer tastings, forest hikes or concerts) are collaborated with. To support and kickstart initial investments for these business models, the cooperative of farmers (COOPBAL) can be involved. Moreso, other farmers can be included for the proposition to increase the scale of the amount of tourists that can be supported or to diversify their propositions to tourists (i.e., being able to provide different farm visits). The digital innovation used at the farmers can help provide insights on the adequate timing of farm visits (e.g., to visit the blossoming of the almond trees or to orchestrate forest hikes based on weather conditions).

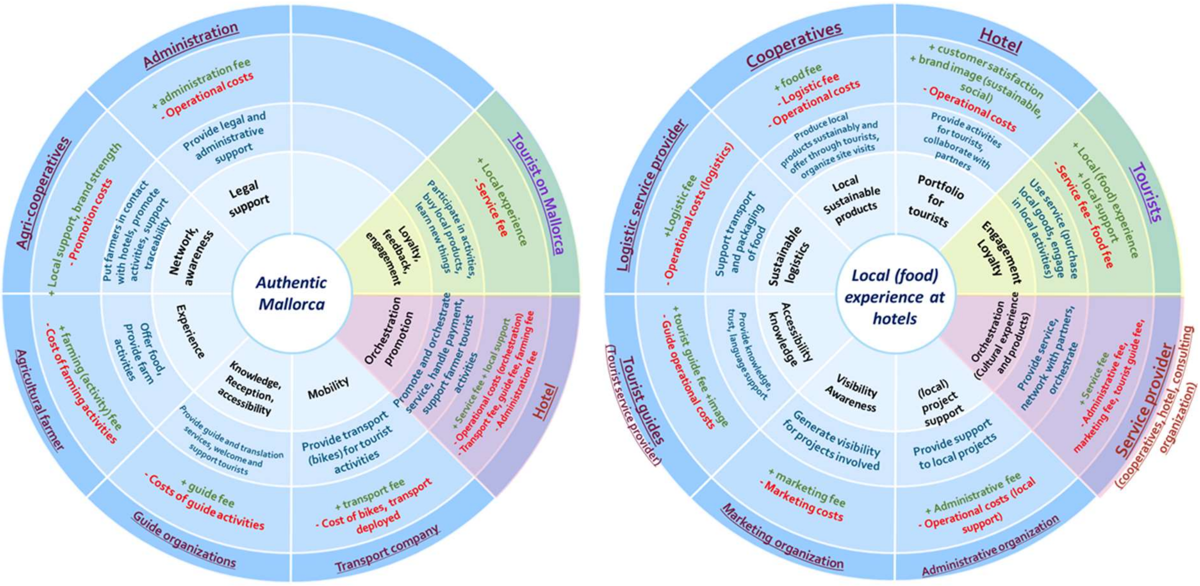

Figure 34 - Business model variants for agri-tourism identified through on-site workshops (cont.)

The alternatives depicted for Figure 34 take the agri-tourism proposition a step further and also include accommodation services. To do so, we observe that the hotel provider is often considered as the orchestrator of the business model design (rather than serving the role of a 'gateway' or 'access point' to agricultural activities hosted at the farmer's location). In this role as orchestrator, the hotel provider offers a complete service proposition to (agri-)tourists which emphasizes aspects such as local and sustainable (which should also be reflected by the hotel provider). Here, hotel providers may also consider to leverage local produce or the support of cooperatives in stimulating this local and sustainable nature of the proposition offered.

3.12.3 Impact logic

Based on the business model design, the impact logic for SIP 11 can be drafted. This logic (modelled through Benefits Realization Mapping) is illustrated in Figure 35. The deliverable central in SIP 11 (the smart farming service at farmers on Mallorca) enables farmers to generate insights on farming practices. On the one hand, this helps farmers to improve their efficiency of farming activities as well as helps them to achieve more sustainable business practices. It also enables farmers to use this data to enable additional value propositions / to communicate on how products have been produced.

To generate the insights through the smart farming service, access to the service is needed. This is supported through Anysolution, which offers access to the smart farming service to farmers. To do so, two prerequisites should be in place: on the one hand, farmers are expected to pay a technology /

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smart farming service fee to Anysolution. On the other hand, sensors should be installed at farmers for the smart farming solution to be used. Logically, farmers should have a reason to pay for the service, meaning that it should be apparent how the solution will create value for the farmer (warranting a smart farming fee). This adoption should be supported through Anysolution and COOPBAL (and potentially Agromallorca): these parties should make explicit how the farmers can use the data generated to enable additional service propositions, what the value of digital solutions is and support farmers in doing so (for example by collaborating with the farmer to set up tourist activities). Additionally, they should help in ensuring that the smart farming service is used properly.

Once sensors are installed (and access is granted), data collection at the farmer on its farming practices commences. As explained, information such as temperature, humidity, water, fertilizer, and pesticide use (amongst others) can be collected. This data is collected for the NADIA platform and can be (re)viewed by farmers through dashboards included for the platform. Based on the insights generated, Agromallorca can moreover provide advice or support to farmers on how farming practices can be improved. Through adoption of this advice by the farmer, farming practices consequently can be improved.

As explained, the data collected can also be used to enable new service propositions to tourists. To do so, the resources and capabilities of tourism service providers should be integrated, working towards holistic tourism experiences that can be offered to tourists (including accommodation, catering and transportation). This calls for close collaboration between farmers, COOPBAL, Agromallorca and tourist service providers in order to establish such holistic tourist service offerings. In addition, Agromallorca may also combine this through providing locally produced goods to tourists as an additional service proposition. WP3 will investigate with SIP11 on what service propositions can be considered as part of this.

Through the proposed business model design and business changes imposed, the farmer is able to benefit from improved efficiency, access to alternative business models (related to tourism) as well as sustainable and social value (being rewarded through locally produced products). However, the farmer is required to adopt the smart farming solution and share data in order to make this work. It is also required to steer its farming activities based on the insights generated through the smart farming service. Furthermore, to provide tourist activities, the farmer may need to develop additional capabilities and resources. This can pose quite a significant shift as opposed to its traditional business practices. Lastly, for the current business model design, the farmer *is* required to pay a fee for using the smart farming service, placing the investment risk at the farmer. However, the value to be achieved through use of the smart farming service can still be uncertain (are tourists for example interested in pursuing agri-tourism experiences?). WP3 will explore with SIP 11 how this risk for the farmer can be further reduced.

In terms of scaling, SIP 11 intends to scale to solution to other farmers on Mallorca (post-pilot). To do so, it can involve other farmer's cooperatives to reach additional farmers for the smart farming service. It also is required to work on service propositions that can be enabled as part of the smart farming solution – to do so, other tourism service providers should be involved over time. Through scaling of the amount of farmers as well as the set of tourism service providers, increasingly larger agri-tourism service propositions can be offered. This can contribute towards the impact objectives set for SIP 11: to help farmers become more sustainable on Mallorca, and to improve the image of Mallorca (through strengthening agri-tourism).

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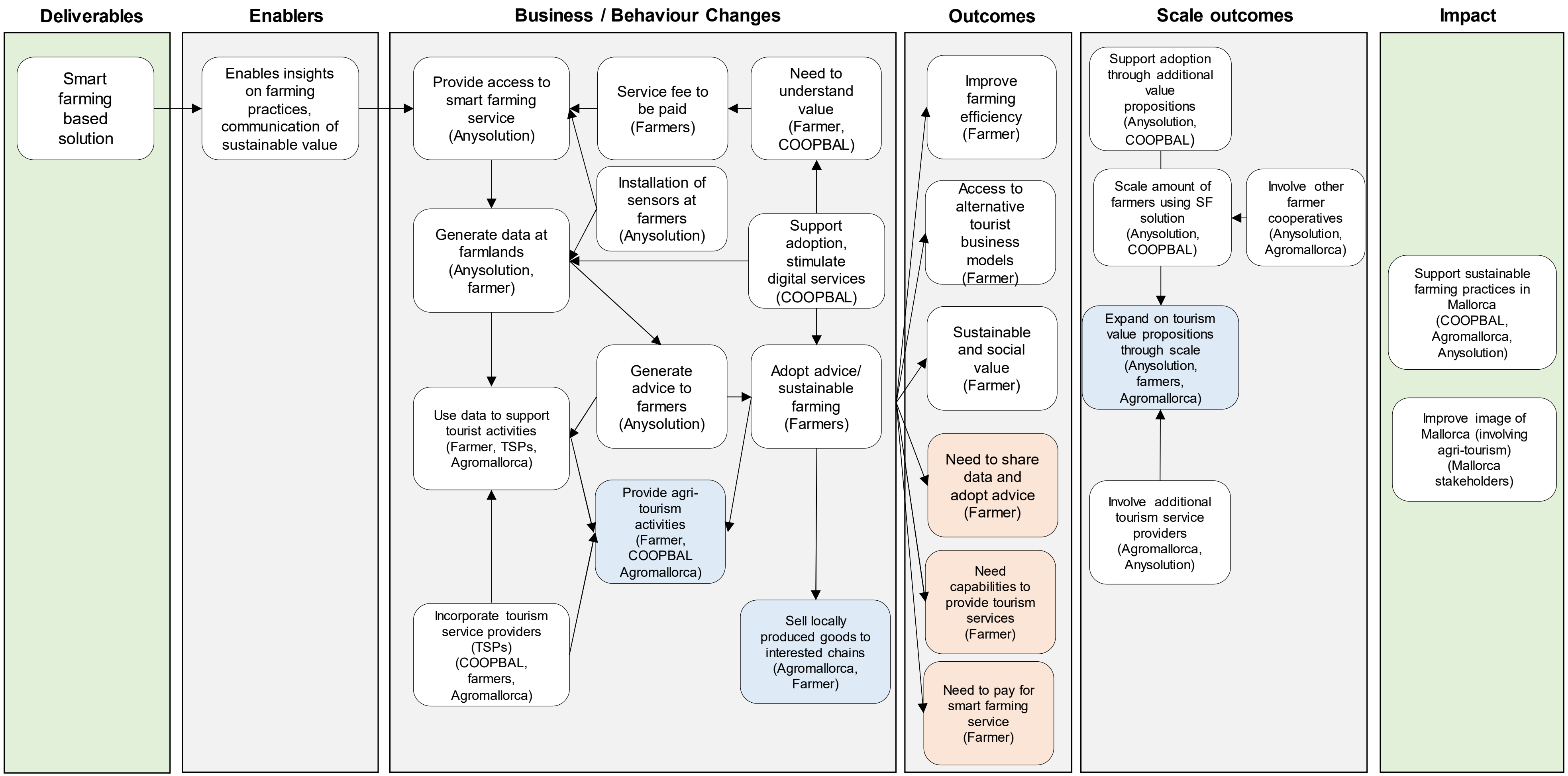

Figure 35 - Impact logic for SIP11

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3.12.4 Strategic implications and challenges faced

For the current business model design, the farmer is expected to pay a smart farming service fee to Anysolution in order to use the smart farming service. Through use of the service, efficiency benefits (which can be monetized) can be obtained, whereas the data collected may also help in enabling tourism service propositions. Through this structure, the risk of investments is placed at the farmer, for which (largely) uncertain benefits are proposed in return or benefits which can potentially have a longer payback time. Without clarity on these benefits, farmers may therefore be reluctant to adopt the smart farming solution. More so, the value that can be captured through tourism-based services requires farmers to develop capabilities and resources in terms of providing such services. This can pose additional investments for farmers they are not necessarily willing to make. The role of Agromallorca is key here to support this: to collaborate with farmers to set up tourism-based services or to integrate on-site visits at farmers as part of the portfolio of services offered by tourism service providers (but without creating significant dependencies). Additionally, COOPBAL should continuously focus on explaining the value of adopting digital solutions to support farming practices.

It should also be noted that the effectiveness of tourism-based service propositions can depend on whether neighboring farmers also strive for sustainable farming practices. Although it is the intention of SIP 11 to support sustainable farming practices for *all* farmers in Mallorca, the difference in time of adoption can influence the success of tourism-based services offered by individual farmers.

3.12.5 Next steps

As a next step, SIP 11 is focusing on the realization of one of the agri-tourism propositions, namely to connect a field visit to the almond trees (the blossoming of the almond trees) to hotel chains as sustainable activity to provide. To do so, it is working with the local government in Mallorca to create awareness on this value proposition (i.e. to advocate the visit as a key or ‘official’ proposition in Mallorca), as well as simultaneously integrating the activities of farmers (collecting data on the suitable time for field visits) and hotel chains (providing activities to tourists to experience the blossoming of the almond trees) to provide the proposition in practice. Current efforts have already led to this service proposition being considered as an ‘official’ tourism experience. Here, subsequent efforts are dedicated towards scaling the amount of farmers and hotel chains involved in providing this experience.

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4 General insights on sustainable and digitally-enabled business models in agriculture

The business models and additional analyses presented in this deliverable describe configurations which delineate how organizations can collaborate to support the realization, adoption, and use of digital innovations in practice, with the intention of generating sustainable value. In this section, we aggregate the findings per SIP and provide general insights on the role of sustainable collaborative business models in supporting digital innovation for sustainability in the agriculture domain.

4.1 Outcomes

The primary contribution of the SCBMI approach is that the designed business models provide a concrete perspective on how organizations together create and capture value with the digital innovations in the agri-food supply chains. Business models are critical in exploitation and aligning views with stakeholders.

The SCBMI approach also led to strategic implications for the organizations in the SIPs. The SCBMI approach reinforces the capability of the organizations in the SIP to collaborate with other organizations. Active participation in networks adds to the resilience of organizations.

- Some collaborations even extend beyond existing value chains, as they address new sectorial collaborations, e.g., insurance, ICT and agro in SIP2, agro and tourism in SIP5 and SIP11, and agro and food system with societal organizations in SIP8. Sectorial collaboration provides new opportunities and this adds to an organization's and sector's economic sustainability.
- Furthermore, the experiences and concrete tooling and examples have also underpinned the organizations' business modelling capabilities. This adds to the economic sustainability of organizations, as future innovations will also require business model innovation.
- The SCBMI approach has been instrumental in scaling and replication, by describing and understanding the business model, e.g., in SIP8 (Serbia and North-Macedonia), SIP3 (France and Greece) in SIP11 (explore multiple business models in agro and tourism). Scaling and replication are necessary to achieve substantial impact with investments.
- The approach has also helped in identifying complementary resources, e.g., in SIP8 the need for additional human resources in the logistics of the foods was identified. This underpins the value of SCBMI to identify risks and avenues for extension of the business model.
- The work on business modelling leads in cases also to the reconsideration of position in the ecosystem: In SIP2 and SIP10 the orchestrating actor is moving from a service provider to a platform and service provider, offering its own and 3rd party services. In SIP8 new positions are explored by moving from a platform provider to a white label platform software provider. In SIP7 a scenario in which a data sharing cooperative is conceived would lead to new positions. Lastly, in SIP8 the specification of the business model led to the reconsideration of the orchestrating party if that position in the ecosystem would actually fit its current strategy and capabilities. This is important as the business model thus operationalizes and challenges current strategy.

SIPs have also used the opportunity to work more tailored on their business ventures with ad-hoc support. This has led to in-depth analysis of customer processes (SIP3), business processes (SIP6) and

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concrete action plans in other SIPs (i.e. SIPs 4 and 9). This adds to the operationalization and further progress of the innovations so far developed in the SIPs.

4.2 Typology of governance structures for value creation and capture in sustainable collaborative business models

Lack of resources is often considered as an important barrier in the access to and adoption of digital innovations to support sustainable farming efforts (Annosi et al., 2020; Elijah et al., 2018). Through collaborations with the SIPs, we conclude that this challenge is also prevalent for farmers in Ploutos. 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. Here, we observe that different forms of governance structures for value creation and capture can be selected which can help SIPs 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 can be observed in SIP 6, 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 KGZS. 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 SIP 6 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 SIP 6 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 (which for example is the case in SIP 4, in which UNICA, the cooperative of farmers in Spain, supports its participating farmers through shared investments). 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

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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 SIP 8, in which the farmers purchase the carbon sequestration service to further contribute towards their sustainability goals. 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 of 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 SIP 2: 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 SIP 2, 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, SIP 2 employs informal mechanisms to build the trust relationship between Barilla and the farmer, in which Barilla provides

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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 36. SIPs as well as other innovation initiatives in the agriculture domain may build on this typology to support the configuration of their business models.

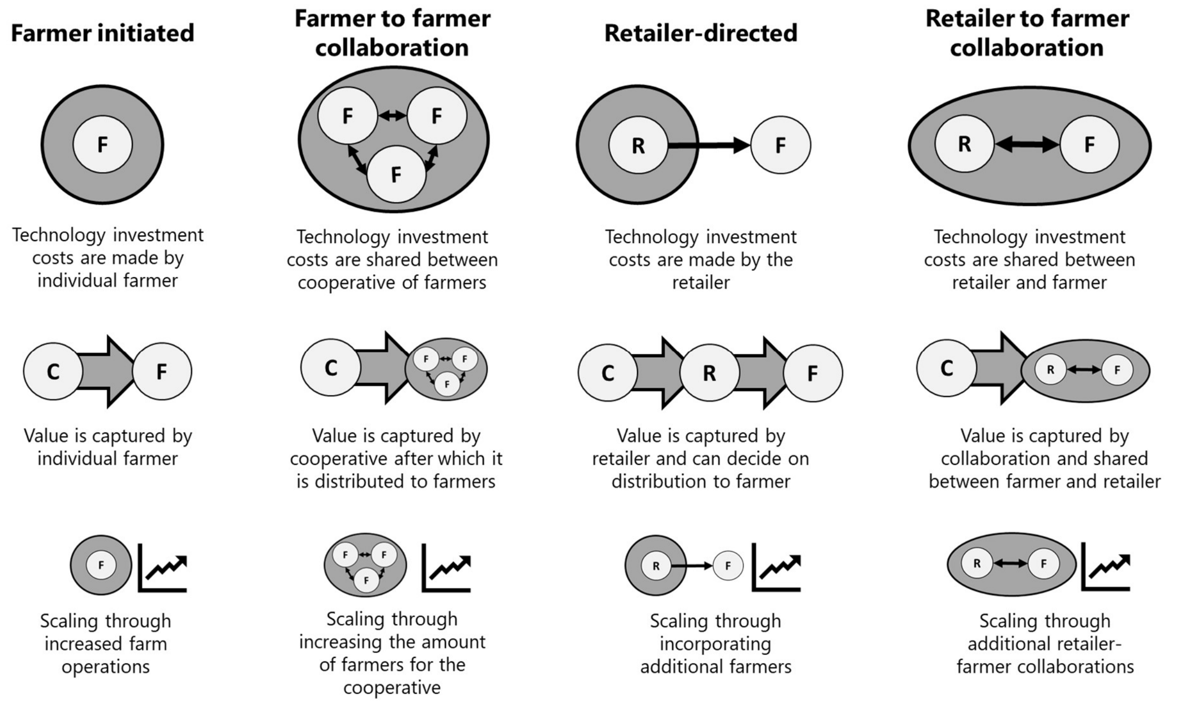

Figure 36 - Typology of value creation and capture mechanisms in sustainable collaborative business models for agriculture

4.3 Diversification of value streams through different roles for the farmer

The outputs of the SCBMI (i.e., the set of collaborative business models produced for the SIPs) also demonstrates that farmers in addition to selling produce to retailers as their key proposition can also diversify their propositions. The insights generated through SIP 5 and SIP 11 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 SIP 10 and SIP 8 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).

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Related to selling transparency, we observe in SIP 6 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 Importance of collaborations between partners across the value chain

In addition to the consideration of opportunities for the diversification of farm operations, we also stress the importance of collaboration in establishing sustainable business models in rebalancing the value chain. We explicitly observe this as part of SIP 3, which demonstrates that a value chain orientation (rather than considering explicit supplier-consumer relationships between organizations in the value chain) can help in ensuring that sufficient value by farmers can be captured. In SIP 3, we observe that the use of the consumer platform offers an integrated perspective on how the organizations in a given value chain should collaborate to be able to produce the products as desired by the community of users. It forces organizations to align their operations to ensure that these products can be created. This effectively contributes towards shortening the value chain and decreases the (perceived) distance between organizations to collaborate. This can help farmers accordingly to move up in the value chain and to improve their relative position. These collaborations may also form outside of current value chains. For example, farmers can collaborate with technology providers to better cater digital innovations to their specific needs, in turn fostering the adoption and effectiveness of these digital innovations in practice.

4.5 Value of experimentation and learning for 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 SIP 1, SIP2 and SIP 4, in which additional farmers over time will be included to support the adoption of digital innovations), *increasing access to resources* (for example observed in SIP 8 and SIP 9, 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 SIP 5 and 11). 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.

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5 Perceptions and recommendations for SCBMI approach

In this section, we describe how the application of and outputs for the SCBMI approach are perceived by the SIPs, and to what extent the SCBMI approach was deemed useful or easy-to-use. As explained, we developed a survey (see Annex) to elicit the perceptions and feedback of SIP stakeholders on the SCBMI approach. Specifically, we asked questions related to:

- The usefulness of the SCBMI approach. To what extent did the SCBMI approach lead to valuable insights on sustainable collaborative business models supporting the digital innovations realized as part of the SIPs? Did business modelling help in advancing the realization and adoption of digital innovations in practice? Did it lead to establishing new collaborations or strengthening existing collaborations within the SIP?
- The ease-of-use of the SCBMI approach. To what extent was the SCBMI approach intuitive and understandable? Were tools used intuitive and did they contribute towards generating additional understanding?
- The next steps regarding SCBMI. To what extent will the outputs of the SCBMI be used post-Ploutos? What next steps are defined for the SIP to further concretize business models to realize digital innovations in practice and to contribute towards sustainable impact?

Below, we list the results of this survey, as well as recommendations we present towards using the SCBMI approach in future innovation initiatives.

5.1 Results of the survey

In terms of usefulness of the SCBMI, the following responses, as visualized in Figure 37 (a,b) and Figure 38, were given (n=15, each SIP has at least 1 representative). These questions focused on the value of using the SCBMI in the context of the SIP (as well as the tools used to do so) as well as the degree to which SIPs would consider using SCBMI for future innovation activities.

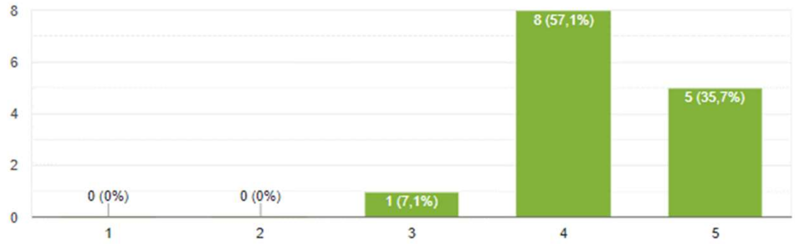

Figure 37a - Extent to which the SCBMI process was deemed useful (1 not very useful, 5 very useful)

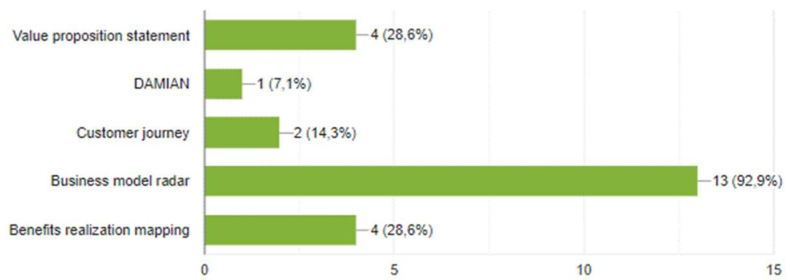

Figure 37b - Usefulness of the tools (multiple tools can be selected)

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What we can observe is that SIP stakeholders generally are positive regarding the SCBMI approach and found it useful to consider it as part of their innovation activities. Here, stakeholders indicated that it helped them get a *better overview of roles and responsibilities, as well as enabled them to make or reconsider strategic decisions*. Alternatively, it helped in *brainstorming new ideas* or *helped in unveiling how value is created and captured between stakeholders* (and what different decision can be made here). However, we also see that that the general tendency is the SCBMI approach can be quite difficult at first glance. General recommendations given include adding additional examples to clarify the use of the tool. Additionally, the often academic speak as part of the tools can be daunting for users less experienced in business modelling or strategic management. These recommendations help in improving the use of the SCBMI approach.

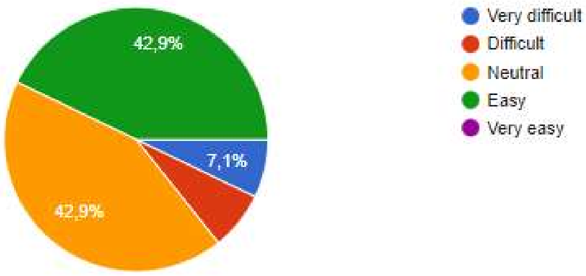

Figure 38 - Difficulty using the tools in SCBMI

Subsequently, we asked participants their perception on what the SCBMI approach has yielded. For example, did following the SCBMI contribute towards building (business) capabilities, or did it help in fostering or establishing new collaborations with partners? The results are illustrated in Figure 39 (a).

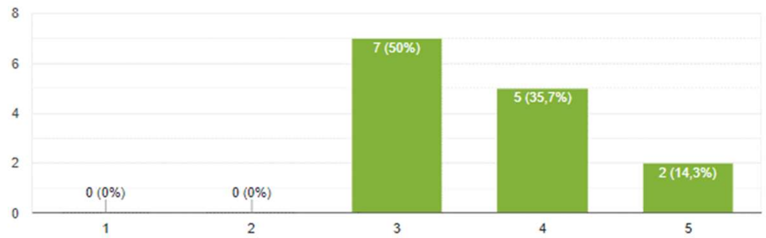

Figure 39a - Impact of SCBMI on building capabilities to support innovation activities (1 not very useful, 5 very useful)

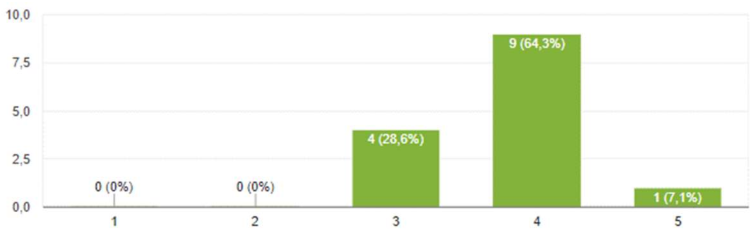

Figure 39b - Impact of SCBMI on fostering Ploutos Principles as part of innovation activities (1 not very useful, 5 very useful)

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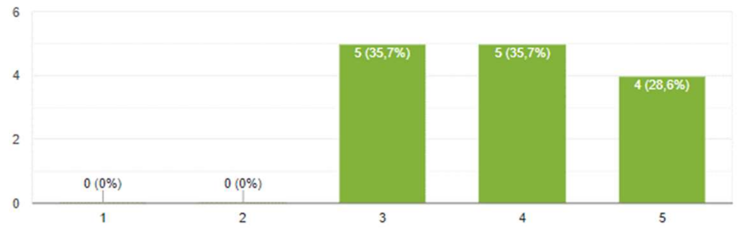

Figure 39c: Impact of Ploutos on fostering or creating collaborations (1 not very useful, 5 very useful)

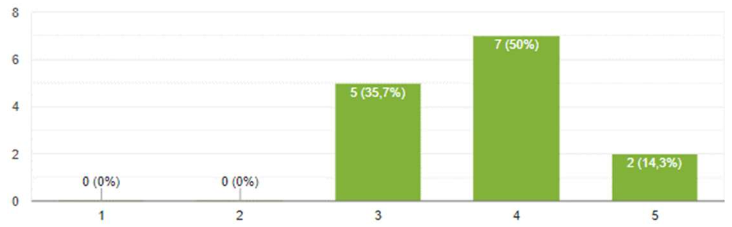

Figure 39d: Impact of Ploutos on fostering or creating collaborations (1 not very useful, 5 very useful)

The results show that the SCBMI approach has contributed towards

- the development of new capabilities,
- towards fostering the Ploutos Principles and
- to establishing new collaborations as part of Ploutos.

In terms of capabilities, stakeholders indicated that it helped them to build a deeper understanding (but also build confidence) of the value of new business models to support their digital innovations and how these can be designed. It helped them to identify opportunities for new services, but also helped them to highlight problems and barriers which potentially can be faced as part of the deployment of new innovations. This can also be related to the Ploutos Principles, which explicates the need to take a farmer-centric approach and to create mutual value for stakeholders involved. Stakeholders indicate that using the SCBMI approach fostered these principles as part of their innovation activities, and to consider, for example, how farmers will use a service or digital innovation in practice and what *added* value as a result would be created (and whether this would be meaningful to the farmer).

In terms of collaborations (Figure 39c and d), we see that the SCBMI approach (as well as the general structure for Ploutos) has contributed significantly. Stakeholders predominantly indicate that as part of the SIP structure, collaborations within the SIP have been strengthened. In SIP 1 and SIP 2, we see that collaborations between Proodos and Alterra (SIP 1) and collaborations between CETIF and Horta (SIP 2) have been fostered to support the realization of digital innovations in practice. Similarly, SIP 8 stakeholders indicated that ZLTO and UDEA intensified their collaboration from the perspective of knowledge exchange (as was the case *before* Ploutos) towards service provisioning (ZLTO, and subsequently its carbon farming partner, will provide services to UDEA post-Ploutos).

We also see that collaborations have been formed *outside* of the initial SIP structures. For example, in SIP 11, clear contracts have been established between the agri-food cooperatives in the Balearic Islands with hotel federations and farmers to jointly provide agri-tourism value propositions. This partnership between different domains (i.e., agriculture and tourism) previously was not present. Similarly, SIP 4 indicates that it has collaborated with partners within Ploutos (but outside of the SIP structure) in developing new European proposals towards the realization of digital innovations in agriculture. Likewise,

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Lastly, we also checked to what extent the outcomes of the SCBMI approach would be used post Ploutos, and what concrete next steps SIP stakeholders would foresee. These steps are documented as part of Section 0. We also asked SIPs to provide feedback on how the value of the SCBMI approach can be increased. Here, the value of face-to-face meeting is stressed to support discussions and decision making between stakeholders as part of a SIP. Additionally, some stakeholders indicate that an up front introduction (before the actual process takes place) can help in already establishing a knowledge base for partners to take part in the SCBMI approach. Subsequently, when actually addressing topics such as defining a value proposition or business model design, partners can rely on an initial understanding of the tools in play.

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6 Conclusion

In this deliverable, we present the final results of the application of the SCBMI approach for the SIPs. Specifically, we describe the *final* collaborative business models for each of the SIPs in Ploutos, as well as present the logic followed towards creating long-term impact. The results presented in this work serve as the basis for further realization and exploitation of the digital innovations in practice. Other innovation initiatives or consortia may build on these results to support the design of their respective sustainable collaborative business models, either using the results as best practice examples or as reference configurations to consider which explain the roles and contributions needed to realize digital innovations in practice. This deliverable (D3.11) is the third and final of three versions covering the Ploutos SCBMIs and data/service valorization for pilots (with the preliminary deliverables being D3.9 and D3.10).

The set of *collaborative business models* as well as their *impact logic* have been generated through interactions with the SIPs as part of the SCBMI approach. Here, we conducted business modelling workshops with the SIPs to (iteratively) design and concretize collaborative business models supporting the digital innovations for the respective SIP. This also allowed us to gain a deeper understanding of potential challenges faced for the SIP (for example in terms of users adoption, financial barriers or alignment between partners to overcome), and how these could be address as part of the design of the business model. We complemented these insights generated through workshops by discussions had with SIPs as part of 1-1 sessions (WP1) as well as documentation on the SIPs collected through other work packages.

In addition to the sustainable collaborative business models and impact logic descriptions, this deliverable also includes ad-hoc results generated through the SCBMI approach. These ad-hoc results dive deeper into the needs of the SIPs and were conducted on a per request basis. Consequently, SIPs 3, 4, 6, 7 and 9 include additional insights on exploitation plans or a preliminary framework to conduct cost-benefit analysis.

Based on the outputs generated, general recommendations can be given to future innovation initiatives or consortia in the agriculture domain. First, we demonstrate that to overcome financial barriers to access and use digital innovations, different value creation and capture mechanisms can be selected. Depending on the type of farmers and stakeholders involved for the initiative, farmers may independently or collectively support the uptake of digital innovations. Alternatively, farmers may collaborate with retailers to make joint investments for digital innovations if sustainable goals can be aligned. In addition, we also show that farmers can diversify their value proposition to improve their relative position. Here, collaborations with different sectors can be considered, or the transparency of sustainable practices can be leveraged. Lastly, we also stress the importance of collaboration and exploration in finding and scaling suitable business models to create long-term impact. Through a holistic perspective of value chains, but also to understand and leverage the roles of partners (such as technology providers, insurance providers) supporting the value chain, a better integration between value chain stakeholders can be established. Subsequently, different scaling strategies can be considered to scale and grow these business models over time. Here, trial-and-error learning is encouraged.

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7 Annex – survey template

WP3 Ploutos survey on sustainable collaborative business modelling – experiences and insights

Dear SIP leaders,

During the Ploutos project, you have participated in designing innovative, collaborative business models supporting the realization of sustainable innovations for your SIP.

We would like to invite you to take part in this survey to gather your feedback and thoughts on the sustainable collaborative business modelling process (SCBMI) applied as part of the Ploutos project. Your comments and suggestions will play a vital role in our continuous improvement efforts and help us enhance our support for pilots like yourself in the future.

Your input is highly valued, and we appreciate the time and effort you will dedicate to completing this survey.

Please take a few moments to share your experiences and insights. We look forward to your valuable feedback.

Sincerely,

WP 3 TNO
----

1. What is your name?

……………………..

2. Please indicate your SIP (mark with X)

SIP 1	SIP 7
SIP 2	SIP 8
SIP 3	SIP 9
SIP 4	SIP 10
SIP 5	SIP 11
SIP 6	

<u>Section 1 – Using the SCBMI approach</u>

3. To what extent did you find it useful to work on sustainable collaborative business models in light of your SIP? (indicate the number)

Not very useful (1) (2) (3) (4) Very useful (5)

4. What aspects of sustainable collaborative business modelling did you find valuable? Why?

……………………..

5. Did the tooling used as part of the SCBMI process help you in shaping your business model and making it concrete? Please elaborate why.

……………………..

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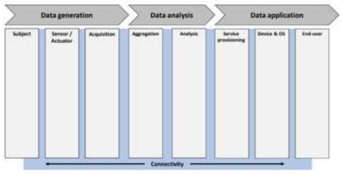
6. Which of the tools presented below did you find most useful during the SCBMI approach? Multiple tools can be selected.

Value proposition statement



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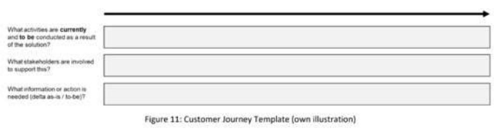
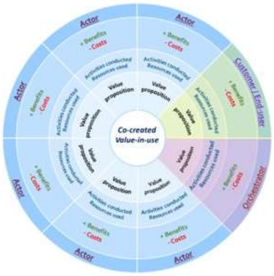


Customer Journey



Business model radar

Benefits realization mapping

……………………..

7. How did you perceive working with the tools? (indicate the number)

Very difficult (1) (2) (3) (4) Very easy (5)

8. In regard to your previous answer, could you explain why?

……………………..

9. Would you use sustainable collaborative business modelling in the future to support your innovation activities? Please explain your answer.

……………………..

<u>Section 2 – Usefulness of the SCBMI approach</u>

10. Did working on sustainable collaborative business modeling help you to develop new capabilities or to improve existing capabilities to support the design of (future) business models? (indicate the number)

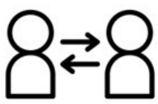
Limited impact (1) (2) (3) (4) Strong impact (5)

11. In regard to your previous answer, if yes, which capabilities did you (further) develop?

……………………..

12. To what extent did sustainable collaborative business modelling help you to incorporate the Ploutos Principles as part of innovation activities for your SIP? (indicate the number)


Farmer centricity


Mutuality


Multiple values


Scalability

Limited impact (1) (2) (3) (4) Strong impact (5)

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13. To what extent did all the Ploutos innovations (in a general sense) help you to create new or strengthen existing collaborations with partners in your SIP? (indicate the number)

Limited impact (1) (2) (3) (4) Strong impact (5)

14. To what extent did sustainable collaborative business modelling help you to create new or strengthen existing collaborations with partners in your SIP? (indicate the number)

Limited impact (1) (2) (3) (4) Strong impact (5)

15. In regard to your previous answer, how many new collaborations did you form? Could you elaborate on the nature or intensity of these collaborations?

………………………

Section 3 – Outcomes of SCBMI after Ploutos

16. To what extent will you use the business model outputs generated through the SCBMI approach for future activities for your SIP? (indicate the number)

Limited use (1) (2) (3) (4) Strong use (5)

17. What next steps do you foresee, after the project, regarding your collaborative business model? What concrete actions will you take to further concretize or realize your business model? Please explain your answer.

………………………

Section 4 – Feedback on SCBMI approach

18. If applicable, in what way could we further improve the SCBMI approach?

………………………

19. Do you have any other suggestions or comments for us?

………………………

Your responses have been recorded. We would like to thank you for your time!

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