



**CO-creating sustainable and competitive FRuits and vEgetableS'
value cHains in Europe**

**Deliverable 1.3
Preliminary framework and set of indicators
for assessing and promoting sustainability, innovativeness and competitiveness of agrifood value
chains**

**Responsible partner:
WAGENINGEN UNIVERSITY**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000852.

Document Identification

Project Acronym	CO-FRESH		
Project Full Title	CO-creating sustainable and competitive FRuits and vEgetableS' value cHains in Europe		
Project ID	101000852		
Starting Date	01.10.2020	Duration	42 months
H2020 Call ID & Topic	RUR-06-2020 - Innovative agrifood value chains: boosting sustainability-oriented competitiveness		
Project Website	https://co-fresh.eu/		
Project Coordinator	Centro Nacional de Tecnología y Seguridad Alimentaria (CNTA)		
Work Package No. & Title	WP1 – Identification, Analysis and Design of Innovative and Sustainable Agri-Food Value Chains		
Work Package Leader	Wageningen University		
Deliverable No. & Title	D1.3. A preliminary framework AND a set of indicators for assessing and promoting sustainability, innovativeness and competitiveness of agrifood value chains		
Responsible Partner	Wageningen University		
Contractual delivery date	M15 - 31 december 2021		
Actual delivery date	20 january 2022		
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Review & Edit	Inés Echeverría Goñi (CNTA)		
Type of Deliverable	Report, including a Toolkit		
Dissemination Level	Public		
Version	1		

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History of changes

Version	Author	Date	Comments
0.1	Celia Cholez, WU Jos Bijman, WU	22-12-2021	First Draft
0.2	Celia Cholez, WU Jos Bijman, WU Maral Mahdad, WU	18-01-2022	Reviewed by Maral and modified by Celia
1	Celia Cholez, WU Jos Bijman, WU Maral Mahdad, WU	19-01-2022	Final version

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Abbreviations and Acronyms

Abbreviation / Acronym	Description
AKIS	Agricultural Knowledge and Innovation Systems
CSA	Community-Supported Agriculture
EU	European Union
FAO	Food and Agriculture Organisation
F&V	Fruits & Vegetables
LCA	Life Cycle Assessment
NGO	Non-Governmental Organisation
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PO	Producers organisation
SAFA	Sustainability Assessment of Food and Agriculture systems
SFSC	Short Food Supply Chain
SFVCD	Sustainable Food Value Chain Development
SI	Sustainable Innovation
SOI	Sustainability-Oriented Innovation
SICO	Sustainability-oriented Innovation COllaboration
VC	Value Chain

Executive Summary

Grand societal challenges, such as climate change, loss of biodiversity, food security, immigration, and digital transformation, urge value chain actors from farm to fork to make the food system more sustainable. In this context, innovation, that has long been considered as a factor of growth and competitiveness, has become increasingly important for creating societal value, including environmental, social and economic benefits. However, generating innovations that lead to sustainability improvements require collaboration among all actors involved in the agrifood chain.

The CO-FRESH project aims to enhance collaboration for sustainability-oriented innovation in the agrifood sector, by proposing interventions for re-designing fruit and vegetable (F&V) value chains across Europe. To reach these objectives, Work Package 1 takes the lead in Identification, Analysis and Design of Innovative and Sustainable Agrifood Value Chains.

This report is the output of Subtask 1.3.2: *Design a framework and accompanying indicators for initiating and promoting innovative, sustainable and competitive agrifood value chains*

This report presents a preliminary framework that complements the classical Triple Bottom Line operationalization of sustainability with a model that focuses on the collaboration needed for generating sustainability-oriented innovations. This framework has been named the CO-FRESH Sustainability-oriented Innovation Collaboration (SICO) framework (Figure A).

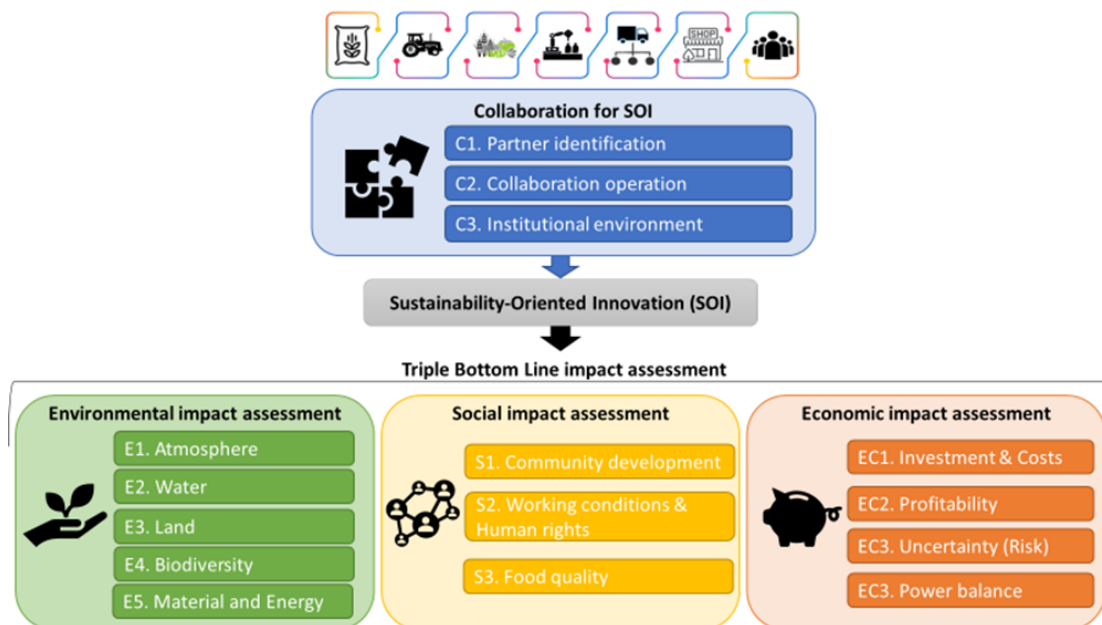


Figure A: CO-FRESH SICO framework (Source: authors)

The report presents the background and rationale for this SICO framework. Based on the literature review presented in Deliverable 1.1., the Sustainability Assessment of Food and Agriculture framework (FAO, 2014b) and the Sustainable Food Value Chain Development framework (FAO, 2014a) have been chosen as a starting point. The report argues there is need to add a value chain collaboration component to existing sustainability frameworks and provides the theoretical background on the critical success factors of collaboration in value chains. Subsequently, the report presents the indicators (Table A) that will be used to assess the extent of collaboration in SOI projects in value chains.

Table A: Collaboration for SOI: themes, sub-themes and indicators

Theme	Sub-themes	Indicators
C1. Partner identification	<i>C1.1. Previous experience</i>	C1.1.1. number of previous collaborations with partner(s) C1.1.2. perception of benefit of previous collaboration C1.1.3. reputation of partner(s) C1.1.4. personal ties with partner(s)
	<i>C1.2. Complementarity & synergy</i>	C1.2.1. scope of the collaboration C1.2.2. complementarity in resources & capabilities C1.2.3. goal congruence C1.2.4. power distribution C1.2.5. geographical proximity
C2. Collaboration Operation	<i>C2.1. Communication & transparency</i>	C2.1.1. frequency of face-to-face interactions C2.1.2. shared data infrastructure C2.1.3. use of common sustainability indicators
	<i>C2.2. Governance structure</i>	C2.2.1. participation in decision-making C2.2.2. joint-investment C2.2.3. use of contracts C2.2.4. level of interdependency
	<i>C2.3. Internal support</i>	C2.3.1. corporate social responsibility C2.3.2. leadership C2.3.3. capabilities for collaboration
C3. Institutional environment	<i>C3.1. Public support for collective action</i>	C3.1.1. public enforcement C3.1.2. operational group support C3.1.3. interbranch organisation support C3.1.4. producer organisation support
	<i>C3.2. Sustainability & quality standards</i>	C3.2.1. use of sustainability standards C3.2.2. EU quality schemes

This preliminary framework and set of indicators will be supplemented with guidelines on how to use them and how to assess the results. These guidelines will take into account the methodologies used for assessing the social, economic and environmental dimensions of sustainability in the CO-FRESH Pilot Cases.

The preliminary framework and the set of indicators will be used in the next steps of the CO-FRESH project, notably Task 2.2 and 2.3, to assess the current situation in the Pilot Cases, to classify innovations in the co-creation process, and to redesign the Pilot Cases into more sustainable and more competitive agrifood chains.

1. Introduction

The CO-FRESH project aims to provide techniques, tools and insights to make agrifood value chains more environmentally sustainable, socio-economically balanced and economically competitive. It does so by promoting collaborative models that support the achievement of sustainability objectives through the combination of technological and non-technological innovations, by designing, testing and assessing innovative business models, by improving value chain transparency and by enhancing fair distribution of costs, risks and benefits along the value chain.

The main objectives of Work Package 1 (WP1) are to identify, analyse and design innovative and sustainable agrifood value chains. WP1 reviewed the literature on sustainability-oriented innovations in agrifood value chains (Task 1.1), provided an inventory of more than 100 innovative and sustainable value chains in European food systems (Task 1.2), built a conceptual framework that can be used to improve the innovativeness and sustainability of agrifood value chains (Task 1.3), and will assess the business models used in innovative and sustainable value chains (Task 1.4), and will provide an inventory and analysis of the impact of the main public policies relevant for strengthening sustainability-oriented innovations in food value chains (Task 1.5).

Task 1.1 has resulted in D1.1. “State of the art summarized in an overview of the key success factors (and their theoretical explanations) of innovative, sustainable and competitive agrifood value chains.” One of the key concepts defined in D1.1 was sustainability-oriented innovation (SOI): “A collaborative process of change directed at improving one or more of the three pillars of sustainability (i.e., environmental, economic and social), relying on a diversity of bundled innovations (notably technological, organizational and institutional), and whose benefits are fairly distributed among the value chain actors”.

Task 1.2 built on the D1.1 report by making use of the definitions, operationalizations and categorizations to create an inventory of European agrifood value chains that have implemented one or more sustainability-oriented innovations. Task 1.2. resulted in D1.2 “List of value chains and a data-set on the characteristics of the identified sustainable, innovative and competitive agrifood value chains”.

Task 1.3. aimed at collecting additional data and using empirical findings to construct a preliminary framework. A first sub-task 1.3.1 consists in an on-going survey that has been sent to the 100+ value chains and will enable to understand the success factors of such value chains and to constitute a portfolio of 20 sustainable business models (Deliverable D1.4). A second sub-task 1.3.2. consists of designing a framework and set of accompanying indicators for initiating and promoting innovative, sustainable and competitive agrifood value chains.

This deliverable D1.3 presents the preliminary framework (called CO-FRESH SICO framework), that emphasizes the collaboration necessary for sustainability-oriented innovation as a way to impact environmental, social and economic sustainability in the value chain. The preliminary framework relies on a set of themes, sub-themes and accompanying indicators that enable to assess the interactions and interdependencies among actors during the collaboration process if developing and implementing the SOI. It also refers to a set of indicators that will be subsequently defined in WP4 of the CO-FRESH project to assess the performance of the SOI based on Life Cycle Assessment and Socio-Economic Cost-Benefit analysis. The preliminary framework will be used in the next steps of the project to assess the current situation in the Pilot Cases (Tasks 2.2 & 2.3) and help to redesign the Pilot Cases into more sustainable and competitive value chains.

This preliminary framework does not intend to be a normative tool but much more a didactive tool that enables reflectivity on the different modes of collaboration in the value chain and their contribution to innovation and sustainability outcomes. The framework will be refined along the CO-FRESH project based on the empirical findings of the Task 1.3.1 survey of the 100+ innovative and sustainable value chains (D1.2. *List of value chains*), the Task 1.4. *Business model portfolio*, the Task 1.5. *Public Policies*, as well as the feedback from the Pilot Case activities in WP2, WP3 and WP4. While this preliminary framework particularly targets the actors of Fruit & Vegetables sector, it is also of interest for other value chains that seek to set up a Sustainability-Oriented Innovation strategy.

This D1.3 report is organised as follow: Chapter 2 presents the background and rationale of the CO-FRESH SICO framework. Chapter 3 presents the preliminary framework and the set of indicators. Chapter 4 discusses and concludes.

2. Background and rationale of the CO-FRESH SICO framework

This chapter presents the background and rationale of the CO-FRESH SICO framework. The first sub-section discusses different sustainability assessments tools applied to agrifood chains that we could take as a starting point. The second sub-section explains why it is needed to include a VC collaboration component to complete traditional sustainability impact assessment frameworks. This sub-section also presents the theoretical background that can support the structure of such component and the development of indicators.

2.1. Value chain sustainability assessment frameworks: SFVCD and SAFA as a starting point

As discussed in the Deliverable 1.1. *Review State-of-the art*, many sustainability assessment initiatives co-exist. Practitioners, researchers and policy-makers have made several attempts to objectify sustainability in the agrifood sector. The methodologies and frameworks differ according to their objectives, scope and target users. Amongst the multiple initiatives, two frameworks developed by the Food and Agriculture Organisation (FAO) of the United Nations were used as a starting point for developing the CO-FRESH SICO framework: the Sustainable Food Value Chain Development approach (FAO, 2014a) and the Sustainability Assessment of Food and Agriculture systems (FAO, 2013; FAO, 2014b).

The Sustainable Food Value Chain Development (SFVCD) is an approach implemented by FAO to accompany the development of value chains, especially in developing countries. The SFVCD approach is not so much a set of indicators, but it is a framework that emphasizes the need to look at the value chain as part of a food system, consisting of various actors that all contribute (in positive or negative way) to the sustainability outcomes of the value chain. The SFVCD approach also emphasizes the institutional embeddedness of the value chain, in systems of rules, norms and cultures, which directly or indirectly influence the behaviour of the actors in the value chain. Finally, the SFVCD approach acknowledges the importance of supporting actors, be they banks or extension services, which need to be in place to provide the value actors with the appropriate services needed for value chain actors to make the proper sustainability-oriented business decisions.

The Sustainability Assessment of Food and Agriculture (SAFA) tool is a set of principles and procedures for assessing sustainability, created by FAO after five years of participatory development. While the Life Cycle Assessment (LCA) approach focuses on the impact of products and processes on sustainability, SAFA is an impact assessment tool targeting the enterprises in the value chain. The SAFA framework consists of a set of four sustainability dimensions: good governance, environmental integrity, economic resilience and social well-being. Each dimension comprises of different themes, sub-themes and indicators. The sustainability themes of SAFA are illustrated in Figure 1.

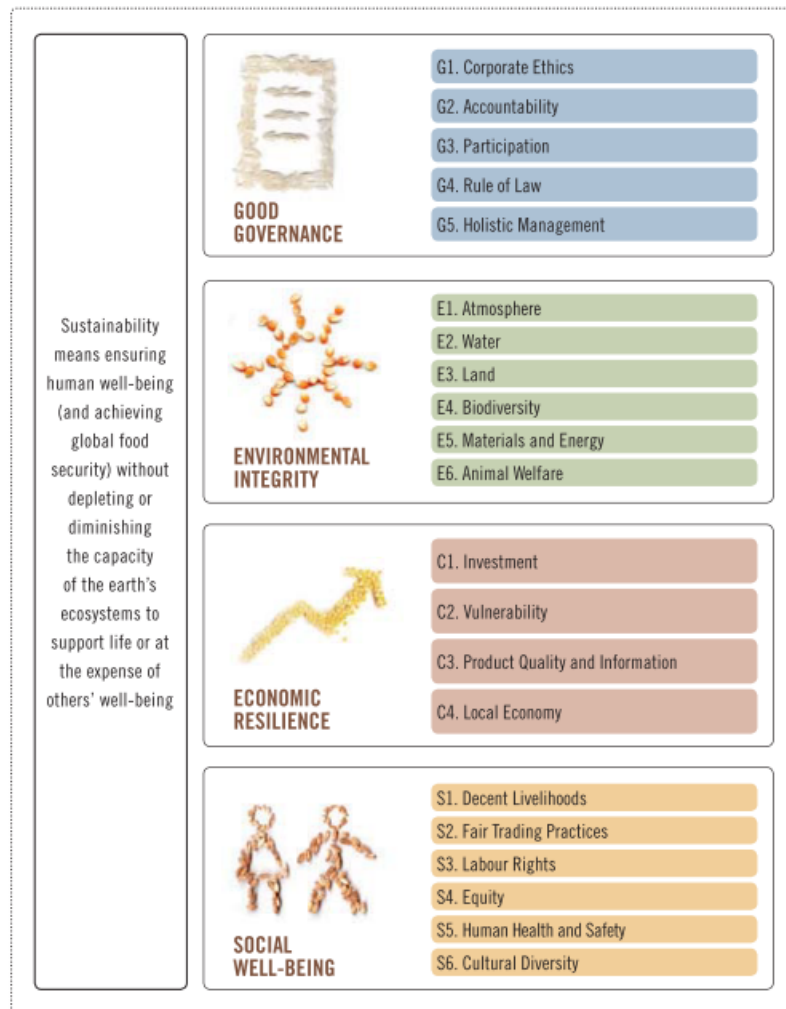


Figure 1: SAFA sustainability dimensions and themes (Source: FAO, 2014b)

For a detailed description of all themes, sub-themes and indicators we refer to the SAFA Guidelines (FAO, 2014b) and List of Indicators (FAO, 2013). Three types of indicators are proposed in the SAFA framework: performance indicators (for instance the volume of GHG net emission of the enterprise); practices indicators (for instance the number of activities that the enterprise implemented to reduce GHG emission); target indicators (for instance the ambition to reduce GHG emissions with a certain amount in the next two years).

The application of SAFA in value chains is based on a formalised procedure including four different steps:

- 1) setting the boundaries of the assessment
- 2) identifying data sources for the assessment
- 3) selecting the relevant indicators for the assessment
- 4) rating the indicators

SAFA and SFVCD are a source of inspiration for developing the CO-FRESH SICO framework. Indeed these approaches enable to assess sustainability at the level of the value chain, and they also aimed at engaging value chain actor in a collective dynamic of improvement. SAFA for instance enables both *ex-ante* sustainability assessment to inform decision-making and *ex-post*

evaluation of the sustainability impact of the actions undertaken. Despite of these advantages, one main limitation of these frameworks is that they do not deeply characterize the governance taking place between the actors of the value chain, or in other word the collaborative dimension required for improving value chain sustainability.

2.2. Enriching sustainability assessment frameworks with a VC collaboration dimension

2.2.1. Adding the governance dimension

Even though sustainability assessment usually relies on the Triple Bottom Line perspective of economic, social and environmental outcomes, some approaches also include a fourth dimension: governance. Governance is about the rules and norms that guide human behaviour in the value chain. It is about formal laws and regulations, about participation in decision-making, but also about informal norms and values that direct and constrain the actions of people and organisations that work together (Hendrikse, 2003).

The SAFA framework includes directly a Governance dimension. But in this case, governance refers mostly to the processes of decision-making and decision implementation within the organisation, namely the corporate governance. Only one theme, the ‘participation’, relates to the inter-organisational governance. It enables to assess stakeholder dialogue, grievance procedures and conflict resolution. In other sustainability assessment tools such as the Global Social Compliance Programme Reference¹ tools, the need for the actors to engage with their suppliers, customers and external stakeholders is often mentioned, but no information is provided on how to manage these collaborative relationships, and how to characterise their governance modes. According to Monteiro et al. (2021), there is a crucial need to go beyond the corporate governance assessment tool to include a broader perspective on governance, an especially to study the governance mechanisms that tie the multiple stage of a value chain. In other words, the governance should also encompass inter-organisational arrangements and the rules that are implemented by the actors of the value chains to frame their collaboration.

To sum up, the governance dimension in SAFA is limited and should be complemented, in particular to take into account collaboration between organizations in the value chain as well as with organizations outside the value chain.

2.2.2. Conceptualising value chain collaboration: theoretical reflections

To enrich the traditional Triple Bottom Line perspective of sustainability with a value chain collaboration component, we need to return to the Economics and Management literature that has conceptualized collaboration. Among the different theoretical branches discussed in Deliverable 1.1, we mobilize the theoretical frameworks from Neo-Institutional Economics, Supply Chain Management and Resource-Based View.

Neo-institutional Economics theoretical frameworks

Ostrom’s work on *Governing the Commons* analyses “the likelihood of undertaking diverse forms of collective action” for solving problems related to common goods, in particular natural resources. For her, “collective-action problems occur when individuals choose actions—such as whether to build and maintain an irrigation system—in an interdependent situation” (Ostrom, 2010: 155). She provides an analytical framework on how structural variables affect the core relationships of reputation, trust, and reciprocity and how these affect levels of cooperation. Ostrom’s work is relevant to mobilize for the

¹ <https://www.theconsumergoodsforum.com/social-sustainability/sustainable-supply-chain-initiative/key-projects/benchmarking-recognition/global-social-compliance-programme/>

CO-FRESH SICO framework since she stressed the importance of looking at the distribution of the benefits both for the actors involved in the collective action and for the actors external to the group. The latter is a key issue when analysing sustainability of agrifood chains because the sustainability outcomes should not only benefit the value chain actors.

Transaction Cost Theory (TCT) analyses the modes of coordination between interdependent actors. Williamson (1991) has shown that transactions can be carried out within different organisational structures (called governance structures), depending on the attributes of the transaction and level of coordination needed. This TCT framework is relevant to mobilize in the CO-FRESH project since collaboration in sustainable agrifood chains is likely to require an intermediate level of coordination that cannot be reached by market mechanisms only (Ménard & Valceschini, 2005; Ménard, 2018).

Supply Chain Management

Collaboration is a core factor in supply chain management and sustainable supply chain management (Li et al., 2014). Indeed, in their analysis of the impact of sustainable operations on the Triple Bottom Line, Gimenez et al. (2012) showed that individual supply chain sustainability action have hardly any impact if they are not accompanied by collaboration in the supply chain. Collaboration is also the most frequently observed critical factor for sustainable supply chain innovation (Gao et al., 2017; Nilsson & Goransson, 2021). Collaboration in supply chains can be categorized depending on the types of actors collaborating and their position in the value chain: vertical upstream, vertical downstream, horizontal with competitors or horizontal with other organisations (Barratt, 2004).

Resource-Based View

The strategic management theories of Resource-Based View (Barney, 1991) and Relational View (Dyer and Singh, 1998) emphasise the role of resources and relations as the core success factors in explaining the competitive advantage of the firm. Companies with unique resources and/or with strong alliances are expected to perform better than competitors that do not hold those resources and/or maintain those partnerships. Bringing the value chain to a higher level of sustainability requires joint-learning and knowledge sharing among the actors of the value chain (Carter & Rogers, 2008). This goes beyond the mere selection and monitoring of the partners (Reuter et al., 2010). Complementarity of resources can both be a prerequisite for successful collaboration in value chains and the result of the collaborative process. *“When collaborative relationships are integrated and synergistic, it is possible to exchange knowledge, develop innovative capabilities, and generate complementary resources, thereby increasing the possibility of value creation for the entire supply chain”* (Neutzling et al., 2018: 3451).

Collaboration is one way of achieving access to resources. Resources needed for SOI include financial capital, physical assets but also immaterial resources such as human capital and knowledge (Fawcett et al., 2008).

Insights from Neo-institutional Economics, Supply Chain Management and Resource-Based View are useful to inform the likelihood of collaboration for SOI in agrifood chains. Also, these theories rely on compatible assumptions such as the bounded rationality assumption. Nevertheless they take slightly different perspectives on collaboration, as shown in Table 1.

Table 1: Different perspectives on collaboration

Theoretical branches	Treatment of collaboration	Key concepts/ Critical factors
NIE / Managing the Commons	Success of collective action and cooperation in managing common pool resources	Trust Reciprocity
NIE / Transaction Cost Theory	Choosing the proper governance structure (i.e., contractual arrangement) that minimizes transaction and coordination costs	Specificity of assets Uncertainty Contracts
Supply Chain Management	Collaboration in the supply (or value) chain in order to optimize logistic processes, including quality control and information exchange.	Knowledge and information sharing Alignment of activities in the chain
Resource-Based View	Collaboration entails sharing of resources, in order to strengthen the competitive advantage of the chain	Sharing resources and capabilities

(Source: authors)

3. The CO-FRESH SICO framework

This section presents our original framework of collaboration for SOI in agrifood value chains, which we have named the SICO framework. We first present the general structure of the framework (3.1) and then deepen the collaboration component (3.2.) and the Triple Bottom Line impact assessment components (3.3).

3.1. General Framework

Figure 2 presents the CO-FRESH SICO Framework. This framework targets practitioners willing to develop a collaborative strategy for implementing a sustainability-oriented innovation in the value chain. Following Deliverable 1.1., we define SOI as “a collaborative process of change, initiated by an organisation, directed at improving the three pillars of sustainability, relying on a bundle of innovations (technological, organisational and institutional), and whose benefits are fairly distributed across the value chain and external stakeholders”. The framework can be used as a reflective tool to disentangle the factors that will make the collaboration for SOI impactful. It can be used both prior to the implementation of SOI to help decision making on how to design the collaboration for SOI, or after the implementation of SOI as a way to assess the collaboration and its impact on sustainability. This framework does not intend to be normative but is meant as an action-oriented tool.

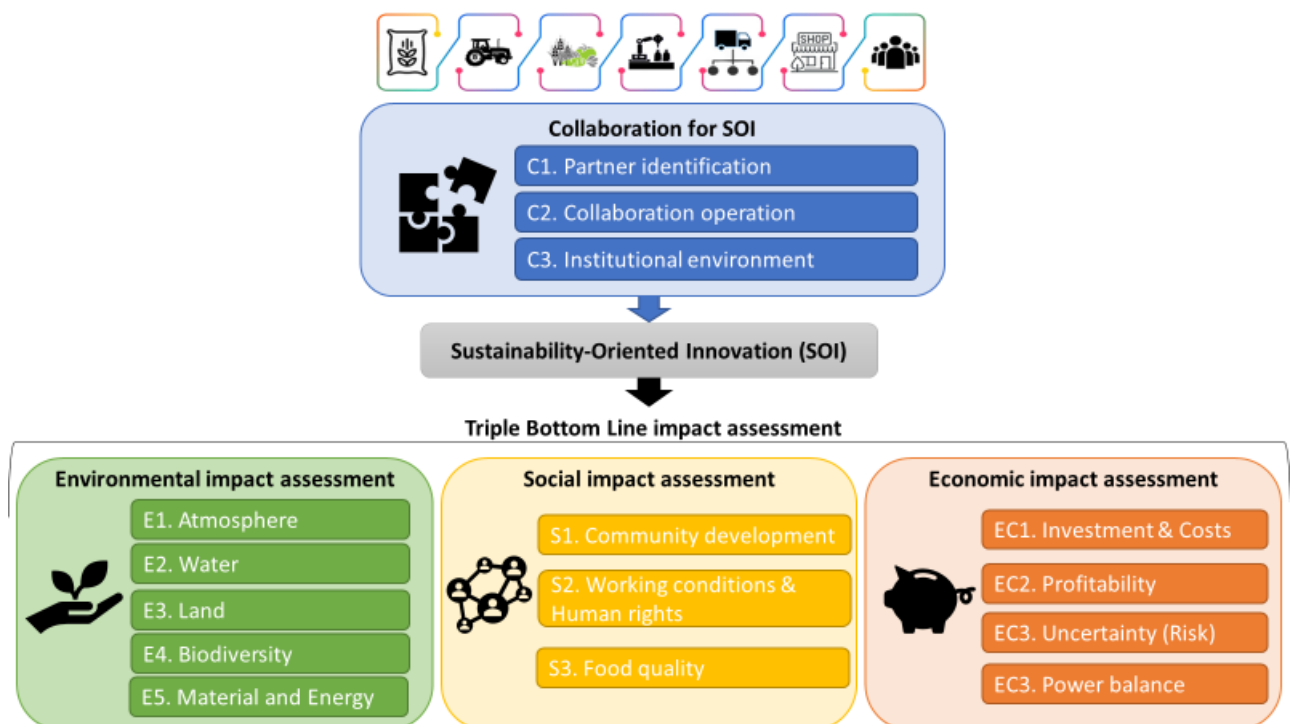


Figure 2: CO-FRESH SICO framework (Source: Authors)

The SICO framework is composed of four major components, articulated around the central concept of Sustainability-Oriented Innovation (SOI).

The first component, and focal topic of this report, is the **Collaboration for SOI**. This first component enables to assess transformative change in the value chain through collaboration for SOI.

The three other components refer to the Triple Bottom Line of sustainability: **Environment, Social and Economic**. They enable to assess the performance of the SOI at the value chain level.

Following the SAFA approach, each component is composed of themes. Each theme is then decomposed into sub-themes, which refer to sustainability objectives specific to value chains. Finally, each sub-themes is assessed by a set of indicators.

The CO-FRESH Framework relies on both **indicators of performance** and **indicators of practices**. These indicators have been developed by CO-FRESH partners Wageningen University, ACTALIA and CREDA. Figure 3 summarizes the embeddedness of the themes, sub-themes and indicators in the CO-FRESH SICO framework.



Figure 3: Themes, sub-themes and indicators in the CO-FRESH SICO framework (Source: Authors)

The scope of application of the CO-FRESH SICO framework is the value chain (especially value chains of Fruit & Vegetables). Setting the boundaries of the value chain is then a prerequisite before starting any component assessment. Assessment of the four components of the SICO framework enables to identify areas to be improved in the value chain (so-called sustainability hotspots) and to critically reflect on the set-up of the collaboration.

Finally, detailed guidelines for using the framework in the co-creation workshops for SOIs will be developed (to be used in work packages 2 and 3 of the CO-FRESH project). In particular, this deliverable presents indicators that can be measured at the level of a focal organisation in the value chain, at the level of a collaborating group, or at the level of the whole value chain. Detailed information on the metrics of indicators, the methodology for measuring them, as well as the aggregating rules will be presented in the guidelines.

3.2. Collaboration for SOI: themes, sub-themes and indicators

The SICO framework highlights the dimension ‘collaboration for SOI’ as a key component. Table 2 presents the themes and sub-themes of the ‘collaboration for SOI’ as well as a set of indicators adapted to F&V value chains.

Table 2: Collaboration for SOI: themes, sub-themes and indicators

Theme	Sub-themes	Indicators
C1. Partner identification	<i>C1.1. Previous experience</i>	C1.1.1. number of previous collaborations with partner(s) C1.1.2. perception of benefit of previous collaboration C1.1.3. reputation of partner(s) C1.1.4. personal ties with partner(s)
	<i>C1.2. Complementarity & synergy</i>	C1.2.1. scope of the collaboration C1.2.2. complementarity in resources & capabilities C1.2.3. goal congruence C1.2.4. power distribution C1.2.5. geographical proximity
C2. Collaboration Operation	<i>C2.1. Communication & transparency</i>	C2.1.1. frequency of face-to-face interactions C2.1.2. shared data infrastructure C2.1.3. use of common sustainability indicators
	<i>C2.2. Governance structure</i>	C2.2.1. participation in decision-making C2.2.2. joint-investment C2.2.3. use of contracts C2.2.4. level of interdependency
	<i>C2.3. Internal support</i>	C2.3.1. corporate social responsibility C2.3.2. leadership C2.3.3. capabilities for collaboration
C3. Institutional environment	<i>C3.1. Public support for collective action</i>	C3.1.1. public enforcement C3.1.2. operational group support C3.1.3. interbranch organisation support C3.1.4. producer organisation support
	<i>C3.2. Sustainability & quality standards</i>	C3.2.1. use of sustainability standards C3.2.2. EU quality schemes

(Source: Authors)

Hereafter, we describe the content of each theme and sub-theme, and we propose indicators.

C1. PARTNER IDENTIFICATION

Theme goal

The organisations of the value chain are aware that the initiation of the collaboration plays a key role in the future success of it. They know how to identify relevant partners and to assess the characteristics of the future partners.

Sub-theme C1.1. Previous experience

Sub-theme objective

The organisations of the value chain use their past experience and the ones of potential partners to select their partners for collaboration in the SOI project.

Description

Neo-institutional Economics consider that history matters when it comes to collaboration. For Ostrom (2010), knowing history and having previous experience will enhance the success of collective action. On the one hand, successful collaboration in the past tends to reinforce the trust between partners, and therefore their engagement in (new) collaboration. On the other hand, knowing the difficulties or failures of previous collaboration enables the partners to anticipate and prevent them of making the same errors. The common learning from previous experience also constitutes a relational asset that is valuable for collaboration in value chains. In addition to tangible outcomes of the collaboration, the perception of reciprocity matters². Nevertheless, relying on previous experiences with collaboration partners may not always be possible especially for new market entrants such as innovative agrifood start-ups.

Reputation, meaning having information about the earlier actions of a proposed partner without having directly working experience with that partner, positively affects the likeliness of collective action. While reputation is easy to monitor in small groups such as farming communities, it is more difficult in larger group such as value chains (Ostrom, 2010). In the latter case, certificates and brands play a significant role in signalling reputation and subsequent trust building (Raynaud et al., 2009). Finally, personal ties pre-existing to a collaboration reinforces trust and the success of collaboration, as shown in strategic alliance literature (Granovetter et al., 1985; Hu et al., 1987) as well as in studies of collective innovation in agrifood chains (Galliano et al., 2017).

Proposed indicators

C1.1.1. number of previous collaborations with partner(s)

Quantitative practice-based indicator measuring the number of previous collaborations among proposed partners

How many collaborations did your organization previously have with the proposed partner(s)?

C1.1.2. perception of benefit of previous collaboration

Qualitative practice-based indicator measuring the reciprocity in previous collaboration with proposed partner(s)

Does your organization consider the outcomes of previous collaboration to be the result of collective efforts of all the partners?

Does your organization consider that the benefits of the previous collaboration were fairly distributed across the partners?

C1.1.3. reputation of partner(s)

Qualitative practice-based indicator measuring the reputation of the proposed partner(s)

How do you rate the reputation of your proposed partner(s)?

C1.1.4. personal ties with partner(s)

Qualitative practice-based indicator measuring the importance of personal relationships with the proposed partner(s)

To what extent are you familiar with the persons you are going to collaborate with?

² According to Ostrom (2010) reciprocity is defined following Malinowsky (1932), as “a mutually contingent exchange of benefits and a set of sentiments associated with mutual gratification” and lies in “the perceived fairness of the transactions” (Hu et al., 1987: 162).

Sub-theme C1.2. Complementarity and synergy**Sub-theme objective**

The organisations of the value chain select their collaboration partners based on the complementarity in resources and capabilities and the expected synergy benefits from collaborating.

Description

The composition of the groups of individuals or organisations affect the likelihood of the collaboration. First the number of participants has been known to have an ambiguous effect. On the one hand, the more participants, the higher will be the transactions costs and the higher the risk of free riding to occurs (Ostrom, 2010). On the other hand, small groups may fail to generate sufficient resources for collective action. In the CO-FRESH SICO framework we choose to focus on other variables that have a more stringent effect on collaboration, namely the complementarity of activities, resources and capabilities of the partners; the goal congruence; the power distribution in value chain; and the geographical proximity between partners.

Heterogeneity in terms of assets and information is known to be detrimental to collaboration because of the higher chance of conflicts of interests and disagreement about benefits distribution (Ostrom, 2010). However, literature on sustainability in agrifood chains shows that coordinated or 'coupled' innovation is required between organisations carrying different activities and embracing different technological steps (Bitzer & Bijman, 2015; Meynard et al., 2017). Therefore, heterogeneity may not be an issue as long as actors can take advantage of the complementarities in the resources they hold (or have access to) and the capabilities, as largely recognised in strategic supply chain management literature (Dyer & Sing, 1988; Das & Teng, 2002; Wohlstetter et al., 2005; Kale & Singh, 2009). Resources include financial capital, physical assets but also immaterial resources such as human capital and knowledge (Fawcett et al., 2008). Capabilities refers both to the technical ability to perform tasks and to collaboration capabilities (De Man et al., 2013).

In addition, a key success factor of collective action is that the participants share a vision and (at least) some common expectations about the outcomes of the collaboration (North, 2005). Congruent motivations of the collaborating partners is a prerequisite for any collaboration initiative in agrifood chains (Pancino et al., 2019). Goal congruence is also known to positively affect collaboration in strategic alliances. This does not mean that participants should have identical goals but that the goals should be compatible and partially common (Das & Teng, 2002; Wohlstetter et al., 2005). In the context of sustainability-oriented innovation, actors have to agree on the direction of innovation before they can aim at economic, social and environmental improvement in the value chains. This adds some complexity for initiating collaboration in value chains, compared to collaboration that would be merely directed at improving economic performance (for instance gaining market power) or mainly directed at managing environmental resources (for instance non-profit initiative for biodiversity conservation).

Power distribution in the value chain will also affect the success of collaboration for SOI (Bonanno et al., 2018). In particular, an unbalance between stakeholders can lead to biased participation in the innovation process and hamper positive innovation outcomes. First, if the innovation is expected to change the structure of power in the value chain by reducing the value of a resource on which a stakeholder bases its power position, then this stakeholder will likely resist this innovation. Second, collaboration for SOI relies on a higher level of coordination than usual market coordination in the value chain; therefore if a stakeholder derives power from the

flexibility of choosing its business partners (for instance flexibility in switching suppliers in the market), he will likely resist the collaborative innovation (Pol & Visscher, 2010).

Finally, the location of partners and their geographical proximity also matters for collaboration for SOI, as it will not only decrease logistics and transaction costs but also enhances knowledge exchange and trust between partners (Galliano et al., 2017).

Proposed indicators

C1.2.1. scope of the collaboration

Practice-based indicator measuring whether the collaboration in the value chain is vertical upstream, vertical downstream, horizontal with competitors, or horizontal with other organizations, or both.

With which of the following organisations do you (plan to) collaborate?

- A. Inputs supplier (for instance technology provider, seed company)
- B. Farmers or farmers organisation
- C. Processing company
- D. Trader or wholesaler
- E. Retailer (for instance supermarket, grocery store)
- F. Consumers
- G. Public research institute, university or government agency
- H. Private service provider (for instance consultant, innovation broker)
- I. Non-Governmental Organisation or Civil Society Organisation

C1.2.2. complementarity in resources and capabilities

Practice-based indicator measuring the complementarity of resources and capabilities across the value chain partners

How do partners evaluate the complementarity in the resources and capabilities they contribute to the collaboration?

C1.2.3. goal congruence

Qualitative indicator to measure the level of goal congruence between partners.

To what extent do the collaborating partners have the same expectations about the innovation outputs?

C1.2.4. power distribution

Qualitative indicator measuring power distribution across the collaboration partners

How is the power distributed among the collaborating partners?

C1.2.5. geographical proximity

Quantitative practice-based indicator measuring the geographical distance between partners.

What is the distance between the collaboration partners?

C2. Collaboration operation

Theme goal

Once the selection of the collaboration partners is done, and the collaboration is initiated on the basis of goal congruence and expected synergy, the operation of the collaboration process for SOI is determining the expected benefits. The organisations of the value chain know the critical factors, including communication and transparency, an adequate governance structure and internal support for joint projects.

Sub-theme C2.1. Communication and transparency

Sub-theme objective

The organisations of the value chain have a strategy for improving communication and transparency across the collaboration partners.

Description

Information exchange, knowledge sharing and communication among the partners is key for the success of collaboration in value chains (Paulraj et al., 2008). Face-to-face communication has been found to positively affect the likeliness of collective action (Ostrom, 2010). One explanation is that it enhances trust and commitment of the partners though enhance solidarity and morality (Ostrom, 2010), while it is also known to foster tacit knowledge transfer (Dyer & Nobeoka, 2000).

At the same time, in the era of digitalization, shared data infrastructure is also a major asset for sharing information remotely between the partners and ensuring a better collaboration (Astill et al., 2019; Annosi et al., 2021). In addition to the way partners communicate, it is also the accuracy, relevancy, completeness, quality and timeliness of the information being shared that matters (Das & Teng, 2002; Fawcett et al., 2012).

Finally, in the context of sustainability-oriented innovations, the consistent use of sustainability indicators across the partners positively affects the outcome of the collaboration (Emden et al., 2006; Hartman et al., 2018).

Proposed indicators

C2.1.1. frequency of face-to-face interactions

Practice-based indicator measuring the frequency of face-to-face interactions between partners

How many times per month do you meet your partners face-to-face?

C2.1.2. shared data infrastructure

Practice-based indicator measuring the use of a shared data infrastructure among the partners.

Does your organisation and your partners have a shared data infrastructure?

C2.1.3. use of common sustainability indicators

Practice-based indicator assessing the consistent use of common sustainability indicators across the partners

Does your organisation and your partners use common sustainability indicators for the SOI project?

Sub-theme C2.2. Governance structure

Sub-theme objective

The organisations of the value chain set up an adequate governance structure, in line with the types of activities and their level of interdependence and asset specificity in the SOI project.

Description

The way the partners organize their actions through rules (both formal and informal) affects the efficiency of collaboration in value chains (Ménard, 2018). The organizational arrangements between participants will determine how partners coordinate their actions, how they align incentives and how they take decision. While transparent sharing of information and communication between the participants are key for collaboration success, also important is the extent to which all participants are involved in the decision-making. Indeed, information transparency in value-chains and participation in decision-making are not necessarily correlated. For instance, Neef & Neubert (2011) show that collaboration for research projects in the agrifood sector can include farmers and citizens in consultative and action-oriented activities without necessarily including them in decision-making. Also, ensuring distribution of decision-making across the partners has been shown to be a success factor of collaboration for strategic alliances (Das & Teng, 2002) but may not be a priority depending on the goal of the collaborative projects (Neef & Neubert, 2011).

Finally the formalization of the collaboration through contracts enables enforcement of agreements among the partners (Vurro et al., 2009) as well as planification of the work (Das & Teng, 2002). Depending on the sustainability-oriented innovations that the actors want to implement in the value chain (product, process, organizational), the contract may concern the R&D activities only or the transactions of raw material or products (for instance production contracts between farmers and processors; community-supported agriculture contracts). In any case, the contractual modes should be aligned with the level of interdependency and assets specificity in the value chain. The more specific the investment³ required, the more the actors should frame their exchanges with contracts to secure their assets and avoid transaction costs (Williamson, 1991; Ménard, 2018).

Proposed indicators

C2.2.1. participation in decision-making

Practice-based indicator measuring the level of participation of each partner in the decision-making during the collaboration process

Who is involved in the decision-making process?

C2.2.2. joint-investment

Practice-based indicator measuring the deployment of joint resources for the SOI project and its distribution across the partners

How are investments distributed among the partner in the SOI project?

C2.2.3. use of contracts

Practice-based indicator measuring the type of contract(s) used to frame the collaboration for the SOI project

Which types of contract does your organisation use for framing the collaboration for the SOI project?

³ The specificity of investment refers to the fact that invested assets are not redeployable without costs.

C2.2.4. level of interdependency

Practice-based indicator measuring the collaborative activities, the level of interdependency and specificity of assets

If you had to change collaboration partners, would it be costly to find another use for the assets you have mobilised for the SOI project?

Sub-theme C2.3. Internal support**Sub-theme objective**

The organisations are aware that in addition to identifying appropriate partners and having a smooth operation of the collaboration, the mobilization of internal resources will also affect the success of the collaboration for SOI. Internal resources (human, financial and physical capital) need to be deployed and organizational culture need to be conducive.

Description

In addition to inter-organisational factors such as communication and a governance structure that enables sharing or pooling of resources for SOI, intra-organisational support also affects the likeliness of a collaboration for SOI to succeed. The existence of a corporate social responsibility culture in the organisation facilitates external collaboration for achieving sustainability outcomes (Porter, 2008; Boiral, 2009). The existence of a leader that promotes a vision of sustainability in the organisation also affects both the ability to lead and to participate in the collaboration (Lenssen et al., 2009; Wiengarten et al., 2017). Finally, the existence of capabilities and managerial support within the organisation are determinants of successful engaging with other organizations. In particular, the experience and capabilities of the procurement team, marketing team and R&D team have an impact on the success of collaboration with external partners (Barratt, 2004).

Proposed indicators**C2.3.1. corporate social responsibility**

Practice-based indicator for measuring the existence of a sustainability culture in the organization

How important is a CSR strategy for your organization?

C2.3.2. internal leadership

Practice-based indicator for measuring the existence of a leader in the organization that can take the lead for setting collaboration with external partners

To what extent do you agree with the statement “in my organisation there is a clear sustainability leader”?

C2.3.3. capabilities for collaboration

Practice-based indicator for measuring intra-organisational support for collaboration for the SOI project

Do you have the support of senior management?

To what extent do the following functional teams in your organisation support the collaboration for the SOI project?

- *procurement team*
- *marketing teams*
- *R&D team*

C3. INSTITUTIONAL ENVIRONMENT

Theme goal

Collaboration for SICO takes place in a broader institutional environment that can constraint or facilitate collective action and innovation in the value chain. The actors in the value chain can rely on different types of institutional support related to the law/regulation for collective action in agrifood chains (such as producer and interbranch organisations), the public or private financial and technical support for innovation, and the existence of sustainability standards.

Sub-theme C3.1. Support for collective action

Sub-theme objective

The organisations are aware of existing institutional support for collective action in agrifood chains and may choose or not to mobilize it in their collaborative set up.

Description

Institutions can both constrain or foster the collective action by setting the rules of the game (North, 2005). When the collaboration in the SOI project relies on contractual formalisation, commitments become more credible when they can be enforced by public order (Mazé & Ménard, 2010). In addition, some public policies explicitly target collective action in agrifood chains, allowing and enabling a deviation from usual competition rules (Raynaud & Valceschini 2005). The objective of these public policies is to mitigate the asymmetric power relations in agrifood chains, for instance through producer and inter-branch organisations⁴ or through contractualization between farmers and food companies⁵. Additional objectives are reinforcing knowledge sharing and fostering innovation in value chains, for instance with the creation of thematic operational groups.

Proposed indicators

C3.1.1. public enforcement

Practice-based indicator measuring the existence of institutions that can guarantee the enforcement of the collaborative agreement

In case one of the partners do not comply with the agreement, can you rely on public institutions to enforce compliance?

C3.1.2. operational group support

Practice-based indicator measuring whether partners mobilize support from an EIP-Agri operational group

Are the collaboration partners member of an EIP-Agri operational group?

⁴https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/agri-food-supply-chain/producer-and-interbranch-organisations_en

⁵ As an example EGALIM 2 law in France provides an institutional framework for fairer farmers revenues <https://agriculture.gouv.fr/infographie-loi-egalim-2-agir-pour-la-juste-remuneration-des-agriculteurs>

C3.1.3. interbranch organisation support

Practice-based indicator measuring whether the partners mobilize support from an interbranch organisation

Are the collaboration partners member of an interbranch organisation?

C3.1.4. producer organisation support

Practice-based indicator measuring whether the partners can mobilize support from a producer organisation

Are the collaboration partners member of a producer organisation?

Sub-theme C3.2. Sustainability standards & quality schemes

Sub-theme objective

The organisations are aware of existing sustainability standards in agrifood chains and may choose or not to mobilize it in their collaborative set up.

Description

The existence of standards of sustainability or quality schemes in the agrifood chains may facilitate collaboration for SOI by provided norms and ready to use metrics, such as GLOBALG.A.P. (Chkanikova & Sroufe, 2021), Fairtrade (Bonisoli et al., 2019) or EU quality schemes⁶. At the same time they may represent additional costs for compliance and certification that the actors may not be willing to pay (Loconto et al., 2018).

Proposed indicators

C3.2.1. use of sustainability standards

Practice-based indicator measuring the use of sustainability standards (for instance, GLOBALG.A.P. Fairtrade, Organic)

Do partners use common sustainability standards?

C3.2.2. EU quality schemes

Practice-based indicator measuring participation in an EU public quality scheme such as Protected Geographical Indication (PGI), Protected Designation of Origin (PDO), and Traditional Specialty Guaranteed (TSG)

Do partners participate in an EU quality scheme?

⁶ https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en

3.3. Triple Bottom Line assessment of sustainability

In addition to the assessment of collaboration in the SOI project, using the above indicators, the CO-FRESH project also assesses the environmental, social and economic dimensions of sustainability.

3.3.1. Environmental dimension: themes, subthemes and indicators

The environmental dimension of the CO-FRESH SICO framework rely mostly on the SAFA Environmental integrity themes and subthemes⁷. Table 3 presents the five themes and twelve sub-themes.

Table 3: Environmental dimension: themes, sub-themes and indicators

Theme	Sub-themes	Indicators
E1. Atmosphere	<i>E1.1. Greenhouse Gas</i> <i>E1.2. Air quality</i>	Default indicators available in SAFA indicators list (FAO, 2013) AND Specific indicators per pilot case, as proposed by ACTALIA in CO-FRESH Work package 4
E2. Water	<i>E2.1 Water Withdrawal</i> <i>E2.2 Water Quality</i>	
E3. Land	<i>E3.1. Soil Quality</i> <i>E3.2. Land Degradation</i>	
E4. Biodiversity	<i>E4.1. Ecosystem Diversity</i> <i>E4.2. Species Diversity</i> <i>E4.3. Genetic Diversity</i>	
E5. Materials and Energy	<i>E5.1. Material Use</i> <i>E5.2. Energy Use</i> <i>E5.3. Waste Reduction and Disposal</i>	

(Source: adapted from SAFA, 2014)

For each sub-themes, default performance indicators are proposed by SAFA (FAO, 2013). In the CO-FRESH SICO framework, context-specific indicators will be developed by ACTALIA in WP4 for each of the 7 pilot cases of the project. These indicators will be quantitative and in line with the LCA-Assessment standardised methodology ‘Product Environmental Footprint’⁸ (See Deliverable D4.1 and D4.2. of the CO-FRESH project).

⁷ The E.6.theme “Animal Welfare” of SAFA is not relevant for the CO-FRESH framework and therefore does not appear.

⁸ ACTALIA will apply the Product Environmental Footprint methodology <https://ec.europa.eu/environment/publications/recommendation-use-environmental-footprint->; as well as the norms ISO 14040 [<https://www.iso.org/fr/standard/37456.html>] and ISO 14044 [<https://www.iso.org/fr/standard/38498.html>]

3.3.2. Social dimension: themes, subthemes and indicators

The social dimension of the CO-FRESH framework is defined according to the main sustainability challenges in Fruit & Vegetables sector, reviewed in D1.1. Our framework differs from the SAFA framework, as it has been developed by CREDA on the basis of other sources. Table 4 presents the three themes and nine subthemes.

Table 4: Social dimension: themes, sub-themes and indicators

Theme	Sub-themes	Indicators
S1. Community development	<i>S2.1. Community development in rural areas</i> <i>S2.2. Linking farmers with consumers</i>	Specific indicators per pilot case, as proposed by CREDA in CO-FRESH Work package 4
S2. Working conditions and human rights	<i>S2.1. Labour rights of permanent and non-permanent workers</i> <i>S2.2. Inclusion of socially vulnerable people</i> <i>S2.3. Non-discrimination</i>	
S3. Food Quality	<i>S3.1. Food product safety</i> <i>S3.2. Healthy diets</i> <i>S3.3. Food access</i> <i>S3.4. Food culture & gastronomy</i>	

(Source: Authors)

In the CO-FRESH SICO framework, context-specific indicators will be developed by CREDA in WP4 for each of the 7 pilot cases of the project. These indicators will be quantitative and in line with the Social Life Cycle Assessment methodology (UNEP-SETAC, 2009) (See Deliverable D4.1 and D4.2. of the CO-FRESH project).

3.3.3. Economic dimension: themes, subthemes and indicators

As in the SAFA, the CO-FRESH framework focus on meso and micro-economic impact assessment. Nevertheless, the themes and subthemes of the SICO Economic dimension differ substantially from SAFA⁹. Table 5 presents the 4 themes and 9 sub-themes.

⁹ We consider “food safety and quality” as social sub-themes in the CO-FRESH framework while SAFA consider these sub-themes as economic. Liquidity of enterprises is not addressed in the CO-FRESH framework. Value creation is assessed in general in the CO-FRESH framework and no focus is done on local economy.

Table 5: Economic dimension: themes, subthemes, and indicators

Theme	Sub-themes	Indicators
EC1. Investment & Costs for SOI	<i>EC1.1. Distribution of investment & costs across partners</i> <i>EC1.2. Specificity of the investment of the partners</i>	Specific indicators per pilot case, as proposed by CREDA in CO-FRESH Work package 4
EC2. Profitability/Benefits of SOI	<i>EC2.1. Profitability of SOI for the partners</i> <i>EC2.2. Distribution of the benefits across the partners</i>	
EC3. Uncertainty (risk)	<i>EC3.1. Demand uncertainty</i> <i>EC3.2. Production uncertainty</i> <i>EC3.3. Market price uncertainty</i>	
EC4. Power balance in the VC	<i>EC4.1. Freedom of Association and Right to Collective Bargaining</i> <i>EC4.2. Price negotiation reflecting production costs</i>	

(Source: Authors)

In the CO-FRESH SICO framework, context-specific indicators will be developed by CREDA in WP4 for each of the 7 pilot cases of the project. These indicators will be based mainly on an Extended Cost Benefit Analysis (ECBA) (See Deliverable D4.1 and D4.2. of the CO-FRESH project).

4. Conclusion

The CO-FRESH SICO framework has been developed for two purposes. First, it can help practitioners that want to set up or reinforce collaboration for Sustainability-oriented Innovation in agrifood value chains. Second, it can be used as a tool for assessment of the strength of collaboration in SOI projects. The framework shows which factors are determinants in making collaboration for SOI impactful. The current preliminary framework is inspired by the FAO guidelines for Sustainability Assessment of Food and Agriculture (SAFA) and the Sustainable Food Value Chain Development (SFVCD), as well on the review of literature as presented in D1.1.

The framework is based on four components articulated around the concept of SOI. The collaboration for SOI component addresses the factors influencing the success of collaboration, including partner identification, operations of collaboration and institutional environment. The three other components refer to the Triple Bottom Line assessment through the Environmental, Social and Economic components.

The SICO framework can be used prior to the implementation of the SOI to support decision-making on how to design the collaboration for SOI, or after the implementation of the SOI as a way to assess the collaboration and its impact on sustainability.

Further development of the framework and refinement of the indicators are foreseen in three subsequent steps of the CO-FRESH project.

First, the elements of the preliminary framework will be tested with empirical data. In task 1.2. of the CO-FRESH project, a participatory inventory, done by the CO-FRESH consortium, enabled to collect information on more than 100 value chains in which an SOI has been implemented. The general characteristics of these value chains as well as the types of innovations have been presented in the Deliverable 1.2. To better understand the success factors of the SOI and explore the role of collaboration for SOI, we have designed a survey targeting the organisations that have led the SOI process in each of the 100+ value chains.

The survey addressed the four components of the CO-FRESH SICO framework. For each component, a set of questions were developed to measure the perceptions of the respondent. The diffusion of the survey was made through tailor-made invitation prepared by WU and sent by each corresponding partner in September 2021. At this moment (December 2021) the survey is still on-going, and results will enable to empirically assess the CO-FRESH SOIVC framework, and to weigh the relative importance of each theme and subtheme for Fruit & Vegetables value chains.

Second, guidelines will be developed for using this framework in co-creation workshops. The next step in making this framework ready-to-use is the development of a detailed set of guidelines that will indicate how to use the framework and indicators, what scales and answer options need to be used for each of the indicators, and how composite indicators need to be aggregated. In coordination with CO-FRESH WP2 and WP4 we aim to further operationalize the framework and indicators, for instance in the co-creation workshops that will be held with the Pilot Cases.

Finally, the SICO framework goes further than previous value chain sustainability assessment frameworks, by highlighting the collaboration component in value chains. Using such a framework will therefore benefit to value chains actors willing to foster collaboration toward more sustainability, as well as public policy makers wanted to benchmark current practices in value chains. Similarly to the SAFA that required several years of participatory development, the SICO framework will benefit from future continuous improvement through the CO-FRESH intervention research project as well as through further interactions between researchers and practitioners.

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