



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

Deliverable D1.2

**List of value chains AND a data-set on the characteristics of the identified
sustainable, innovative and competitive agrifood value chains**

Responsible partner: Wageningen University (WU)

v1



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Abbreviations and Acronyms

Abbreviation / Acronym	Description
AKIS	Agricultural Knowledge and Innovation Systems
CSA	Community-Supported Agriculture
EU	European Union
F&V	Fruits & Vegetables
HQ	Headquarter
IQF	Individually Quick Freezing
NGO	Non-Governmental Organisation
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PGS	Participatory Guarantee System
PO	Producers organisation
SFSC	Short food supply chain
SFT	Smart Farming Technologies
SI	Sustainable innovation
SME	Small and Medium Enterprise
SOI	Sustainability-oriented Innovation
VC	Value Chain

Executive Summary

Grand societal challenges, such as climate change, environmental degradation, food security, immigration, and digital transformation, urge value chains actors from farm to fork to interact for improving the system. In this context, innovation, that has long been considered as a factor of growth and competitiveness, becomes an increasingly important factor to create value while addressing sustainability challenges (both environmental, social and economic).

The CO-FRESH project aims to enhance collaboration for sustainability-oriented innovation in the agri-food sector, by proposing interventions for re-designing fruit and vegetables (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 Agri-food Value Chains*. The current report is the outcome of *Task 1.2. Identify innovative agri-food value chains and collect empirical data*.

Deliverable 1.2. presents a list of value chains and a data-set on the characteristics of the identified sustainable, innovative and competitive agrifood value chains. This list is the results of a participatory inventory led by WUR and involving all the CO-FRESH consortium partners.

This report contains three core elements. **First**, it presents the methodology that was used for the inventory creation, drawing on the concepts and selection criteria developed in *D1.1.Review state of the art*. **Second**, the report provides the list of the selected 100+ value chains and their general characteristics. **Third**, the report shows the different types of sustainability-oriented innovations implemented in these value chains, as well as the various modes of collaboration used to design and implement the innovations.

The inventory has been presented to the CO-FRESH consortium during a workshop held 7 October 2021 (CO-FRESH Milestone 2). The inventory will be used in the next step of the project for further data collection and analysis (Task 1.3). For the next milestone, a survey will be addressed to a representative of each of these 100+ value chains in order to gain better understanding of the drivers of collaboration and to assess the impact of the sustainability-oriented innovation implemented. Second, the inventory will be used to select and investigate a portfolio of business models in the Task 1.4. Based on this inventory and the following analysis in Task 1.3 and Task 1.4, recommendations will be developed for interventions to redesign the value chains of the CO-FRESH pilot cases.

1. Introduction

The CO-FRESH project aims to provide techniques, tools and insights to make agri-food 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 smart 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 cost, risk and benefits along the value chain.

The main objectives of Work Package 1 (WP1) are to identify, analyse and design innovative and sustainable agri-food value chains. WP1 will provide a review of the literature that sustainability-oriented innovation in agri-food value chains (Task 1.1), an inventory of more than 100 innovative and sustainable value chains in European food systems (Task 1.2), the building of a conceptual framework that can be used to improve the innovativeness and sustainability of agri-food value chains (Task 1.3), an inventory and exploration of the business models used in innovative and sustainable value chains (Task 1.4), and 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 agri-food value chains.” Task 1.2 is building on D1.1, by making use of the definitions, operationalizations and categorizations presented in the D1.1 report. 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 along the value chain actors”. Thus, Task 1.2 aimed at making an inventory of European agri-food value chains that have implemented one or more sustainability-oriented innovations.

The identification of the 100+ value chains across Europe was carried out with the support of all CO-FRESH partners. Under guidance from Wageningen University, CO-FRESH partners collected data on several individual sustainable and innovative value chains present in their respective countries and regions. Data was then sorted and included in an overall database.

This deliverable D1.2 presents the list of the 100+ value chains and their characteristics, with a special focus on the type of innovation implemented and the partners involved in the collaboration. This inventory will enable to understand the success factors of such value chains (Deliverable D1.3) and to constitute a portfolio of 20 sustainable business models (Deliverable D1.4) in the next steps of Work Package 1 of the CO-FRESH project.

This Deliverable D1.2 has been presented to the partners at the CO-FRESH General Assembly meeting of 7 and 8 October, 2021, at the premises of CO-FRESH partner CREDA, in Castelldefels, Spain.

The D1.2 report is organised as follows: Section 2 presents the methodology. Section 3 presents the findings. Section 4 discussed the findings and section 5 concludes. The Appendix gives more details on the data collection process.

2. Methodology

The identification of 100+ sustainable, innovative and competitive agrifood value chains was done relying on the definitions and concepts developed in the Deliverable 1.1 “State of the art” and the active participation of the 26 CO-FRESH partners. It was done between April 2021 and September 2021.

2.1. Selection criteria for the inventory of value chains

In the CO-FRESH project, we consider a value-chain as a set of technological activities and we emphasize especially the set of actors that carry such activities and the way they strategically collaborate. Table 1 summarizes the sequences of activities within the value chain.

Table 1: Value chain as a sequence of activities

Activities	
<i>The sequence of activities within the value chain</i>	
inputs supply	The provision of products, such as seeds or fertilizers, that are used by farmers for crop production
crop production	The growing of the crop by farmers or agribusinesses
transformation	The technological processing of a raw material (entire crop or part of it) to transform it into an ingredient or a food product
commercialization	The marketing of the final product to consumers
consumption	The purchase and use of the final product by consumers

We consider a value chain as sustainable and innovative when a sustainability-oriented innovation has been implemented by the actors since at least one year. D1.1. “State of the art” had conceptualise a Sustainability-Oriented Innovation according to the *direction, distribution, diversity, and degree of openness* (see Deliverable 1.1 for more information). For each concept, minimum requirements and selection criteria were defined to guide the partners in their search for value chains. Table 2 summarizes the operationalisation of the concepts and the selection criteria for the creation of the inventory. More information can be found in Annex 1, which represents the instructions that were used for the identification of the value chains by the CO-FRESH partners.

Table 2: Selection criteria for the inventory

Concepts	Selection criteria
Direction <i>The direction of SOI refers to the purpose of the innovation, and whether it is directed at improving the social, economical or environmental pillar of sustainability.</i>	<u>At least two</u> of the three pillars of sustainability must be present
Diversity <i>The diversity of SOI refers to whether what is being innovated is technical, organizational, managerial or institutional innovation.</i>	<u>At least two types</u> of innovations must be present
Degree of openness <i>The degree of openness of SOI refers to who participates in the innovation process and transparency within and beyond the value chain.</i>	The participation of <u>at least two organizations</u> of the value chain, preferably including the farmers
Distribution <i>The distribution of SOI refers to who benefit from the innovation in and beyond the value chain.</i>	<u>At least two organizations</u> of the value chain benefit from the innovation, preferably including the farmers

These criteria have been reported to the CO-FRESH consortium by the end of April 2021 by the WU team through emails, and during the Milestone 1 Workshop that took place on 20th of May 2021. The identification of the value chain complying with such criteria remains into the hand of each of the 26 CO-FRESH partners

and 2 third parties under the general coordination of WU. Indeed each partner has the best knowledge and expertise of the value chains in its own country and territory and could use its professional network for identifying cases. Table 3 presents a list of all CO-FRESH partners.

Table 3: List of the CO-FRESH partners participating in the T1.2. inventory

No	Name (short name)	Type	Co
1	Coordinator: Centro Nacional de Tecnología y Seguridad Alimentaria (CNTA)	RTO	ES
2	Universitaet Hohenheim (UHOH)	RTO	DE
3	Tecnoalimenti s.c.p.a. (TCA)	RTO	IT
4	Ghent University (UGENT)	RTO	BE
5	Wageningen University (WU)	RTO	NL
6	Alma Mater Studiorum - Universita di Bologna (UNIBO)	RTO	IT
7	Warsaw University of Life Sciences (WULS)	RTO	PL
8	Actalia association (ACTALIA)	RTO	FR
9	Centre de Recerca en Economia i Desenvolupament Agroalimentari (CREDA)	RTO	ES
10	Gerace Maria Caterina ("Le Terre di Zoè" Azienda Agricola Biologica) (ZOE)	SME	IT
11	Florette Ibérica, S.L.U. (FLORETTE)	Large ind	ES
12	Food Valley - The Protein Cluster (FoodvalleyNL)	Cluster	NL
13	Chambre d'agriculture du Pays de la Loire (CRAPDL)	Public adm.	FR
14	Stowarzyszenie Polskich Sadowników Ekologicznych (EKOOWOC)	Farmers' Assoc	PL
15	PILZE Nagy Ltd (PILZE)	SME	HU
16	Asociación de Organizaciones Productor de Frutas y Hortalizas Almería (COEXPHAL)	Association Prod. Org.	ES
16.1	(Third party) University of Almería (UAL)	RTO	ES
16.2.	(Third party) UNICA Group	Cooperative business	ES
17	Confagricoltura (CONFAGRICOLTURA)	Farmers' Association	IT
18	Fruitvegetableseurope (EUCOFEL)	Association	BE
19	National Association of Int. Representations for Small-scale producers and service providers KISLEPTEK (KIS)	Producers' Association	HU
20	European Community of Consumer Cooperatives (EUROCOOP)	Consumers' Coop Assoc	BE
21	Cooperatives Europe (COOPSEU)	Cooperatives' Association	BE
22	Bioeconomy Cluster (BEC)	Cluster	SK
23	Organic Agriculture Research Institute (ÖMKI)	NGO	HU
24	Enco srl (ENCO)	SME	IT
25	Future Intelligence Ltd. (FINT)	SME	GR
26	Innogestiona Ambiental (INNOGESTIONNA)	SME	ES

2.2. General characterisation of the value chains in the T1.2. inventory

The main types of information collected about the value chains were:

- 1) the type of crop, the final product and its type (fresh or processed)
- 2) the description of the value chain (activities and organisations involved)
- 3) the value chain scope (national or international), relative to the country of the crop production and the country of sale of the final product
- 4) the qualitative description of the 4 dimensions of the SOI implemented in the value chain: the objectives (i.e. direction); the bundle of innovations (technical, organisational, institutional) (i.e. diversity); the type of collaboration used for it, with the identification of the leading organisation,

and all the organisations participating (i.e. degree of openness) and its impact and benefits (i.e. distribution).

Annex 2 presents the template that was used for collecting all the information to characterise the value chains. The template also enable to identify a personal contact for each value chain, which will not be presented in the D1.2 report for confidentiality reasons. This template was designed by WU team and diffuse in the CO-FRESH consortium together with the selection criteria. Each partner was responsible for filling this template and returning it back to WU. To complete the template, the partners could use public available data (press, website, social media), but also their previous collaboration work, their own expertise of the value chains, and informal talks with the value chain actors. The results presented hereafter comes from the centralisation of the data by WU in an Excel file. Communication back and forth between each partner and the WU team was needed to lead to the final value chain list and general characteristics.

Each value chain has been attributed a unique Code Number, constituting of the code of the partner (01 to 26) followed by a number (01 to XX).

Based on the description of the value chain provided by the partners, and the European definition of Short Food Supply Chain¹, we categorise the value chain as “short” when having 0 or one intermediary between producers and consumers; and “long” when having more than one intermediary between producers and consumers.

For categorising the organisation, we built on OECD definition² and created our own typology, as follow:

- Farm: for a farming enterprise owned by a farmer, independently of its size
- SME: for an enterprise having less than 250 employees and that is operating beyond the farm level
- Large enterprise: for an enterprise having more than 250 employees and that is operating beyond the farm level
- Producer organisation: for farmers group, first or second level farmers cooperative, as well as other organisation involving mostly producers (including interprofessional associations gathering both producers, processors and retailers)
- Food cooperative: for cooperatives involving consumers, together with producers and other stakeholders
- Research institute: for public or private research institutes
- Other: for not-for-profit organisations, non-governmental organisations or foundations, that do not enter in the other categories

To present the results, we used the classic typology of innovations (product, process, organisational incl. managerial, and institutional) and we also propose our own categorization of the Sustainability-Oriented innovations, depending on the technological steps or activities that are targeted in the agrifood chains. This categorization results from an inductive process, and consists of the 6 following innovations:

- 1) Implementing new farming techniques and technologies;
- 2) Implementing new food products for healthier diet;
- 3) Implementing new food packaging systems;
- 4) Organizing the value chain for food waste reduction and valorization of residual streams;
- 5) Improving seasonal workers living conditions;
- 6) Shortening the value chain/ Bringing producers and consumers together.

¹According to the EU, a SFSC is defined as follow “The foods involved are identified by, and traceable to a farmer. The number of intermediaries between farmer and consumer should be ‘minimal’ or ideally nil.” For more information see: <https://publications.jrc.ec.europa.eu/repository/handle/JRC80420>

² <https://data.oecd.org/entrepreneur/enterprises-by-business-size.htm>

3. Results

This section presents the results of the inventory carried by the CO-FRESH partners. First, we provide a list of the 100+ innovative and sustainable value chains that were identified, with their general characteristics. Second, we present the collaboration and the innovations implemented in these value chains.

3.1. List of the 100+ sustainable and innovative value chains

The inventory resulted in the selection of 118 sustainable and innovative value chains. Table 4 provides a list of these 100+ value chains and their characteristics. For each value chain, the focal organisation represents an organisation that has been leading a Sustainability-Oriented Innovation process in the value chain.

Table 4: List of the 100+ sustainable and innovative value chains

VC code	Crop	Product Type	Product description	VC scope	VC type	Focal organisation	HQ location	Type	Age	Link
0101	F&V mix	F&P	Jams, creams, sauces and pâtés	N	long	Espigoladors	ES	Other	5 to 10	https://espigoladors.cat/en/
0102	Grape	P	Wine-making by-products: industrial solvent, wine spirit or liquors, lime tartrate, grape seed oil for cosmetic and food, grape seed flour and dry pomace for feed, enocyanin for nutraceutical use, organic amendment for plant production	N	long	Agralco S.Coop	ES	PO	>10	http://www.agralco.es/quienes-somos/
0103	F&V mix	P	High value extracts and powders made from 17 kind of F&V residues	N	long	Agrosingularity	ES	SME	2 to 5	https://www.youtube.com/watch?v=goLAe9DfyCY
0104	F&V mix	P	Intermediate products: pulps, particulates and purees of fruits aseptically packed, IQF fruits and canned fruits	I	long	Iberfruta– Muerza, S.A.	ES	Large enterprise	>10	http://www.iberfruta.es/

0105	Barley	P	Sourdough bread made with buckwheat and brewer's spent	N	long	Novapan SL	ES	Large enterprise	>10	https://panishop.com/productos/sarraceno/
0201	Pumpkin	P	Ketchup made from pumpkin with wild garlic and herbs	I	long	Georg Thalhammer - Handel mit frischen Bio-Lebensmitteln e.K	DE	SME	>10	https://www.georg-thalhammer.de/
0202	Celery	P	Celery cleanse/juice	I	long	Kale and me GmbH	DE	SME	5 to 10	https://www.kaleandme.de/faqs
0203	F&V mix	F&P	Various F&V	N	short	Netzwerk Solidarische Landwirtschaft e.V.	DE	Other	5 to 10	https://www.solidarische-landwirtschaft.org/startseite
0204	V mix	F	Organic vegetables box sold online (36 species through the year)	N	short	Laiseacker – Naturkost ab Hof	DE	SME	>10	https://www.laiseacker.de/laiseacker/ueber-uns
0205	F&V mix	F	F&V boxes (predetermined or based on consumer choice)	N	short	Ökokiste e.V.	DE	PO	>10	https://www.oekokiste.de/
0301	Orange	P	Pasteurized juice	n.a	long	TCA	IT	Research institute	>10	https://asa-app.it/
0302	F&V mix	F&P	Fresh and minimally processed products directly sale in agrotourism	N	short	Biodistretto della Via Amerina e delle Forre	IT	PO	2 to 5	https://biodistrettoamerina.com
0303	Grain legume	P	Pasta made from pulses (lentils and peas)	I	long	Pedon S.p.A	IT	Large enterprise	>10	https://www.pedon.it/

0304	Tomato	P	Tomato sauce and processed tomato products	N	long	Megamark s.r.l. S.p. Trani	IT	Large enterprise	>10	https://www.liberidiscegliere.eu/
0305	F&V mix	F	Various F&V	N	short	ARVAIA coop	IT	PO	5	https://www.arvaia.it/
0401	F mix	P	Fresh jam	I	short	Callas Confiture BVBA	BE	SME	5 to 10	https://www.callasconfiture.be/en/
0402	F&V mix	F&P	Pickled, jam, veggie burgers	N	short	De loods	BE	SME	>10	https://www.deloodsvzw.be/
0403	V mix	F	Fresh F&V box	N	short	Goedinge	BE	Farm	2 to 5	https://goedinge.be/
0404	F&V mix	F	Various F&V	N	short	Para Ti BVBA	BE	SME	<2	www.para-ti.be
0405	F&V mix	P	Soups made from sale leftover	N	long	Rikolto	BE	Other	>10	https://www.rikolto.org/en/project/robin-food-transforms-food-surpluses-healthy-products-vulnerable-families
0501	Mushroom	F	Fresh mushroom	I	short	Beyond Coffee	DK	SME	2 to 5	www.beyondcoffee.dk
0502	Barley	P	Flour made from brewers spent grain	N	long	Circular Food Technology	DK	SME	2 to 5	www.agrainproducts.com
0503	Salad	F	Fresh salads: leafy greens, microgreens, herbs	N	short	Growx	NL	SME	<5	https://www.growx.co/

0504	Grain legume	P	Fresh and frozen plant protein based meal (veggie burger, veggie balls) made from pulses (lentils, bean, chickpea)	N	long	Hari&Co	FR	SME	2 to 5	https://www.hari-co.com/
0505	V mix	F	Fresh various vegetables	N	short	Neofarm	FR	SME	<5	https://tech2impact.com/startups/neofarm/
0506	F mix	P	Dehydrated fruit slices	N	long	Dry4Good	FR	SME	<2	https://www.dry4good.fr/cp-11-juin-2020
0507	Apple	P	Dehydrated organic fruit snacking 100% fruit (first recipe with apple but also exist for raspberries)	N	long	FruitRide	FR	SME	2 to 5	https://fruit-ride.com/
0508	Chickpea	P	Snacking puffed balls “Coeur de Boule” made of chickpea, tomato and basil	N	long	Funky Veggie	FR	SME	5 to 10	https://www.funkyveggie.fr/
0509	Chickpea	P	Snack	I	long	Bites We Love	NL	SME	2 to 5	https://www.biteswelove.nl/product/crunchy-green-peas-sea-salt-black-pepper-portieverpakking-12-stuks/
0510	Apple	P	Snack bar and bites made from apple and strawberries	I	long	FruitFunk	NL	SME	5 to 10	https://fruitfunk.com/en

0511	Apple	P	Snack "Crispy Bites", bite-sized balls of crispy extruded rice and popped quinoa, in a lovely blend with sunflower seeds and fruit chunks (apples and raspberries)	I	long	SweetLife	CH	SME	2 to 5	https://www.fruit-forest.com/crispy-bites
0512	V mix	P	Vegetable bar made with cacao butter; several recipes including tomato, carrot, leak	N	long	Carré Leon	FR	SME	2 to 5	https://carresfutes.fr/
0601	Garlic	P	The 'Aoglio di Voghiera' protected designation of origin ecotype, sold as green, semi-dry, or dry	I	long	COOPERATIVA VOGHIERESE	IT	PO	5 to 10	https://www.cooperativavoghierese.it
0602	Tomato	P	Tomato products such as chopped, purée, paste, pizza sauce and sauces packaged in different formats	I	long	Mutti S.p.A. Industria Conserve Alimentari	IT	Large enterprise	>10	https://mutti-parma.com
0603	Kiwi	F	Fresh kiwi (Dori Kiwifruit and Hayward kiwifruit)	I	long	PO Granfrutta Zani	IT	PO	>10	https://www.granfruttazani.it/
0604	V mix	F	Fresh vegetables box	N	short	Local to you	IT	SME	5 to 10	https://localtoyou.it
0605	Olive	F	Fresh olives	I	long	UNAPROL - CONSORZIO OLIVICOLO ITALIANO	IT	PO	>10	http://www.unaprol.it/

0701	Quince	P	Tincture, juice, syrup, puree, jam, candied fruit, lemonade and tea mixture made of quince	N	short	Z PIGWOWCA	PL	Farm	>10	https://www.zpigwowca.pl/kontakt/
0702	Garlic	P	Black garlic, with reminiscent of dried plums, soy sauce, balsamic vinegar, aniseed or espresso	N	short	Pięć Przemian Simpatiko s.c.	PL	SME	>10	https://piecprzemian.com.pl/
0703	Berries	P	Organic freeze-dried and powdered fruits in portioned sachets "Wands of Flavour"	I	long	Helpa	PL	SME	2 to 5	https://www.helpa.pl/
0704	Herbs	P	Minimally processed herbal teas: evening primrose, lemon balm, calendula, wild mallow, Helichrysum, nettle, chamomile, peppermint, valerian, St. John's wort and milk thistle	I	long	Dary Natury	PL	SME	>10	https://darynatury.pl/
0705	Cabbage	P	Fermented and pickled cabbages	I	long	Charsznickie Pola Natury sp. z o.o.	PL	SME	>10	http://chpn.pl/

0706	Berries	P	Frozen, precooled, minimally processed or processed berries (raspberry, strawberry, red and black currant, gooseberry, chokeberry, elderberry, blueberry, blackberry, plum, strawberry and cherry)	I	long	Bio Berry Poland Sp. Z o.o.	PL	SME	>10	www.bioberry.com.pl
0801	F mix	P	Canned fruits (pear, peach, apricot, cherry, raspberry, strawberry, pineapple, mango, lychee, kiwi)	I	long	Saint Mamet	FR	Large enterprise	>10	https://www.saintmamet.com/
0802	F&V mix	F&P	40 species of fresh F&V and fruit juice, mash, coulis, soup, vacuum canning	I	long	Demain La Terre	FR	PO	>10	https://demainlaterre.org/
0900	F&V mix	F	Fresh organic F&V boxes	N	short	Disfruta & Verdura	ES	SME	>10	https://disfrutaverdura.com/
1001	Orange	P	Orange sparkling juice	N	long	Comunità Frizzante	IT	SME	2 to 5	https://www.gamberorosso.it/notizie/comunita-frizzante-le-bevande-artigianali-della-vallagarina-nate-da-un-progetto-collettivo/
1002	Prickly pear	P	Prickly pear juice	N	long	SenzaSpine	IT	SME	n.a.	n.a.
1101	Apple	P	Snack made of washed and cut apple, sold in small packages	I	long	Florette Ibérica SL	ES	Large enterprise	>10	https://www.florette.es/familias/snacks-saludables/

1201	Quinoa	P	100% Dutch quinoa ingredients, like starch, flour, crisps and flakes	N	long	GreenFood50	NL	SME	5 to 10	https://nederlandsequinoa.nl/
1202	Mushroom	P	Vegan meal based of residual streams and oyster mushrooms	N	long	Botanic Bites	NL	SME	5 to 10	https://www.doen.nl/en/what-we-do/sustainable-food-system/botanic-bites
1203	Seaweed	P	Burger made of seaweed	N	long	Bobeldijk Food Group	NL	SME	>10	https://dutchweedburger.com/en/
1204	Soy	F&P	A variety of products made with 100% Dutch soybeans	N	long	De Nieuwe Melkboer	NL	SME	2 to 5	https://dutchsoy.nl/
1301	Apple	P	Apple puree	N	long	ELABOR	FR	SME	2 to 5	https://les-producteurs-dabord.com/
1302	Grain legume	P	Feed	N	long	OP Seine et Loire	FR	PO	>10	https://www.youtube.com/watch?v=XEOycXPmtDE
1303	Grain legume	P	Feed	N	long	Valorex	FR	SME	>10	https://www.valorex.com/valeurs-et-engagements/proleval/
1401	Apple	F	Fresh apple	n.a.	short	A farm	PL	Farm	n.a.	n.a.
1402	F&V mix	F	Various F&V	N	short	Jurajska Food Cooperative	PL	Food cooperative	<5	https://www.bondproject.eu/jurassic-food-cooperative-jurnjska-kooperative-spozywacza/?lang=fr

1403	F&V mix	F	Various F&V	N	short	Food Cooperative "Dobrze"	PL	Food cooperative	5 to 10	https://aroundtheworld.coop/portfolio/cooperative-story-13-dobrze/
1501	V mix	F	Fresh vegetables box	N	short	Magosvölgyi Ökológiai Gazdaság	HU	Farm	5 to 10	https://www.valaszonline.hu/2021/05/14/tereny-budapest-school-bps-magosvolgy-riport/
1502	Kiwi	F	Fresh kiwi	N	long	Magyar Kivi	HU	Farm	5 to 10	http://www.magyarkivi.hu/bemutakozunk/
1503	V mix	P	Smoothie made from fresh local vegetables	N	short	Zabosfa Ltd	HU	SME	<5	https://www.zabosfa.hu/en/home/
1504	Rosehip	P	Rosehip oil	I	short	Grapoila (Virgin Oil Press Ltd.)	HU	SME	>10	http://www.grapoila.hu/rolunk?lang=en
1601	Pepper	F	Fresh pepper	I	long	Agroponiente Group	ES	Large enterprise	>10	https://www.grupoagroponiente.com
1602	F&V mix	F&P	Ready-to-eat vegetables	I	long	UNICA Group SCA	ES	PO	>10	https://unicafresh.es/8-snacks-&-ready-to-eat/
1603	Tomato	F	La Cañada-Nijar Tomato Denomination of Origin	I	long	CASI Agricultural cooperative of San Isidro	ES	PO	>10	https://www.casi.es/
1604	Tomato	P	Gazpacho	I	long	Biosabor S.A.T.	ES	SME	>10	https://biosabor.com
1605	Persimmon	F	Fresh persimmon	I	long	ANECOOP	ES	PO	>10	https://anecoop.com/grupo-anecoop/

1606	Cucumber	F	Fresh cucumber	I	long	Alhondiga La Union	ES	Large enterprise	>10	http://www.launioncorp.com/
1701	Grape	p	Grape seed flour for pasta and bakery	N	short	A farm	IT	Farm	>10	n.a.
1702	Salad	F	Fresh salads and aromatics	N	n.a	A farm	IT	Farm	<2	n.a.
1703	Grape	P	Wine	N	n.a.	A farm	IT	Farm	>10	n.a.
1704	F mix	F	Fruit plant	N	n.a.	A farm	IT	Farm	>10	n.a.
1705	Grape	P	Wine	N	n.a.	A farm	IT	Farm	>10	n.a.
1801	Asparagus	F	Fresh asparagus	I	long	Centro Sur	ES	PO	>10	https://centro-sur.es/sostenibilidad/?lang=en
1802	Tomato	F	Fresh cherry tomato	I	long	La Palma	ES	PO	>10	https://granadalpalma.com/en/la-palma
1803	Broccoli	F	Fresh broccoli	I	long	Campo de Lorca	ES	PO	>10	https://campodelorca.com/en/our-company/
1804	Strawberry	F	Fresh strawberry	N	long	AOP n Fraises de France	FR	PO	>10	https://fraisesdefrance.fr/production-francaise/recherche-et-experimentation/

1901	V mix	F	Micro vegetables like coral salad, sauerkraut, baby chard, marjoram, plum basil, coriander	N	short	Bedrock.farm	HU	SME	2 to 5	https://bedrock.farm
1902	F&V mix	F&P	Fresh F&V	N	short	Seasonal Informatikai Ltd.	HU	SME	2 to 5	https://www.ittaszezon.com/
1903	Berries	P	Soda made from raspberry, elderberry, lavender	N	short	SPÁJZ SZÖRP Ltd.	HU	SME	5 to 10	https://hungaricool.hu/gyoztesek/spritz
1904	F&V mix	F&P	Fresh apple, plum, pear, walnut, tomato, paprika, cucumber, mushroom and jams	N	short	Szimbiózis Alapítvány	HU	Other	>10	https://szimbiozis.net/
1905	F&V mix	P	Syrups made from apples, quince, cherries, apricots, plums, pears, rosehip, elderflower, acacia flower, etc.	N	short	Valaha Tanya - Family Ecological Farm	HU	SME	>10	http://valahatanya.hu/
2001	F&V mix	F	Fresh clementine, blueberry, strawberry and asparagus	I	long	Port International	DE	SME	>10	https://www.beclimate.com/en/#brand
2002	F&V mix	F	Fresh F&V	N	short	Ma Coop La Vie au Vert	FR	Food cooperative	2 to 5	https://fondation.credit-cooperatif.coop/ma-coop-la-vie-au-vert
2003	Salad	F	Fresh salads	I	short	Infarm	DE	SME	5 to 10	https://www.infarm.com/en

2004	F&V mix	F	Fresh F&V	N	short	Marché d'Intérêt National de Montpellier Méditerranée Métropole Mercadis	FR	PO	>10	http://www.mercadis.net/
2005	Mushroom	F	Fresh oyster mushroom	N	short	Permafungi	BE	SME	5 to 10	https://www.permafungi.be/
2101	F&V mix	F	Fresh F&V	I	short	Bees Coop Srl	BE	Food cooperative	<5	http://bees-coop.be/
2102	F&V mix	F	Fresh F&V	N	short	CAMILLA – EMPORIO DI COMUNITA' – SOC. COOPERATIVA	IT	Food cooperative	<5	https://camilla.coop/
2103	F&V mix	F	Various F&V and saffron spice	N	short	Ghinghinelli Società Cooperativa Agricola	IT	PO	5 to 10	https://www.ghinghinelli.it/
2104	F&V mix	F	Various F&V	N	short	Les Petits Producteurs SCES	BE	PO	<5	https://lespetitsproducteurs.be/cooperative/
2105	F&V mix	F	Various F&V	N	short	Som Alimentació S.Coop.V.	ES	Food cooperative	<5	https://somalimentacio.com/
2201	Pumpkin	P	Snack made from pumpkin seeds and pumpkin oil	N	short	Marta Kozárová farm	SK	Farm	>10	https://www.farma-tekvicka.sk/
2202	V mix	P	Kimchi – Korean style fermented vegetables made from onion, spring onion, garlic, pore, ginger, carrot, radish, Chinese cabbage, chili	I	long	Flying Composites, s.r.o.	SK	SME	<5	www.kimchi.sk

2203	F mix	F&P	Fresh apples, plums, strawberries, fresh and pasteurized apple juices (10 sorts), dried apples & plums	N	short	FRUCTOP, s.r.o.	SK	SME	>10	www.fructop.sk
2204	V mix	F	Fresh seasonal vegetables including micro-vegetables	N	short	Agrokruh Slovakia	SK	PO	<5	http://agrokruh.sk/
2205	V mix	F&P	Fresh seasonal vegetable boxes delivered at home; fresh juices, smoothies and concentrated elixirs; fresh salads, sandwiches, burritos, puddings	N	short	Dream Farm	SK	Farm	<5	https://www.dreamfarm.sk/
2301	V mix	F	Fresh vegetables	N	short	Farm2Fork	HU	SME	2 to 5	https://www.farm2fork.hu/en/about
2302	Tomato	F	Transplant	N	short	ÖMKi	HU	Research institute	>10	https://biokutatas.hu/en/
2303	F&V mix	F&P	Home made fresh & processed food	N	short	Somogyi Helyi Termék Egyesület	HU	PO	<5	https://shte.hu/
2304	F&V mix	F&P	Fresh and processed organic food	N	short	Nyíregyházi Kosárközösség	HU	Food cooperative	5 to 10	https://kosarkozosseg.hu/
2305	F&V mix	F	Fresh organic vegetables	N	short	Zsámboki Biokert	HU	Farm	>10	https://en.zsambokibiokert.hu/

2401	Almond	P	Taralli made of almond flour	I	long	TERRADIVA Azienda Agricola Biologica	IT	SME	>10	https://www.terradiva.it/europe/
2402	Olive	P	Extra Virgin Olive Oil	I	long	FRANTOIO MURAGLIA	IT	SME	>10	https://www.frantoiomuraglia.it/?gclid=Cj0KCCQjwh_eFBhDZARIsALHjKdH_rwpBZbz7Unp2VyPucnk2djajhB8PIVy3RbzIDd_DWDiDdEam24aAbh7EAlw_wcB
2403	Lemon	F&P	Focus on lemon snack	I	long	OP Ancona	IT	PO	>10	https://www.opancona.it/
2404	Grape	P	Wine	I	long	CANTINA DEI COLLI RIPANI	IT	PO	>10	https://colliripani.com/
2405	Spirulina	P	Dehydrated organic Spirulina (flakes, noodles, powder)	I	short	ALGREEN B.V.	IT	SME	5 to 10	https://www.algreen.eu/
2501	F mix	F	Fresh cherries and nectarines	N	n.a.	A farm	CY	Farm	n.a	http://www.moa.gov.cy/moa/ari/ari.nsf/index_gr/index_gr?opendocument
2502	F mix	F	Fresh strawberries and tomatoes	I	n.a.	A farm	CY	Farm	n.a	http://www.moa.gov.cy/moa/ari/ari.nsf/index_gr/index_gr?opendocument
2503	Olive	P	Olive oil	I	n.a	Stamna Olives	GR	PO	<5	https://stamnaolives.gr/
2504	Olive	P	Olive oil	I	n.a.	Lia Cultivators	GR	SME	5 to 10	https://liaoliveoil.com/en/

2505	Sea buckthorns	P	Dehydrated <i>Hippophae</i> (superfood)	I	short	Rezos Brands	GR	SME	>10	https://rezosbrands.com/
2601	Cherries	F	Fresh cherries	n.a.	long	Grupo Alba Int. SLL	BE	SME	>10	https://grupoalba.es/
2602	Acorn	F	Dry sweet acorn	N	short	Sociedad Civil el Progreso de Ganaderos y Granjeros	ES	PO	>10	https://www.herdadedofreixodomeio.pt/
2603	Acorn	P	Acorn flour	N	long	Dehesa Vegana	ES	SME	2 to 5	https://jerezdeloscaballeros.hoy.es/veterinario-jerezano-antonio-20190312073820-nt.html
2604	Spirulina	P	High-quality spirulina strands	n.a.	short	Koru Espirulina	ES	SME	5 to 10	https://koruespirulina.com/contacto/
2605	Olive	P	Olive oil	N	short	Oleosetin	ES	Farm	>10	https://oleosetin.com/almazara/

Crop: refers to the name of the crop, or to a mix of fruits and vegetables (F&V mix), a mix of fruits (F mix) or a mix of vegetables (V mix)

Product type: refers to the final product sold in this value chain, that is either fresh (F) or processed (P)

VC scope: refers to the scope of the value chain, either international (I) or national (N)

VC type: refers to the value chain type, either long (if more than one intermediary between producers and consumers) or short

HQ location: refers to the headquarter location, either in Belgium (BE), Switzerland (CH), Cyprus (CY), Germany (DE), Denmark (DK), Spain (ES), France (FR), Greece (GR), Hungarian (HU), Italy (IT), Netherlands (NL), Poland (PL), Slovakia (SK)

Type: refers to the type of focal organisation, either a small and medium enterprise (SME), a large enterprise, a farm, a producer organisation (PO), a research institute, or "other" type (NGO, foundation, etc.)

Figure 1 represents the location of the 100+ sustainable and innovative value chains, based on the headquarter location of the focal organisation in each value chain.

Figure 1: Map of the selected value chains



For more details, see the following link: [Maptive | VCs](#)

3.2. General characterisation of the collaborations and sustainable innovations in the value chains

In each of the inventoried value chain, a collaborative process of innovation toward more sustainability was at stake. Table 5 therefore characterizes each value chain according to:

- 1) the type of collaboration partners
- 2) the type of innovation either product, process, organisational (including managerial) and institutional
- 3) the category of Sustainability-Oriented Innovation implemented

Table 5: Types of collaboration partners and innovations

VALUE CHAIN CODE	COLLABORATION PARTNER TYPE							INNOVATION TYPE				SUSTAINABILITY ORIENTED INNOVATION CATEGORY					
	INPUTS & TECHNOLOGY PROVIDER	FARMERS & PRODUCERS ORGANISATION	FOOD INDUSTRY & RETAILER	CONSUMERS & CIVIL SOCIETY	PUBLIC AGENCIES & RESEARCH INSTITUTE	NGO	PRIVATE CONSULTANCY ORGANIZATION, INNOVATION BROKERS, START-UP HUBS	PRODUCT	PROCESS	ORGANISATIONAL incl. managerial	INSTITUTIONAL	NEW FARMING TECHNOLOGIES & PRACTICES	NEW FOOD PRODUCTS & PROCESS	FOOD WASTE REDUCTION AND RESIDUES VALORIZATION	NEW FOOD PACKAGING SYSTEMS	IMPROVING WORKING CONDITIONS STANDARDS	SHORTENING FOOD SUPPLY CHAIN
0101	1	1	1		1	1		0	0	1	1			1			
0102		1						1	1	0	0		1	1			
0103		1	1					1	0	0	1		1	1			
0104	1	1						1	1	0	0	1	1	1			
0105		1	1					1	1	1	0		1	1			
0201		1						1	1	1	0		1	1			
0202			1	1				1	0	1	0				1		
0203		1		1		1		0	0	1	1						1
0204		1	1					1	0	1	0				1		1

0205		1		1				0	0	1	1						1
0301	1				1			1	0	0	0				1		
0302		1		1	1			0	1	1	1	1					1
0303		1	1					1	0	1	0		1				
0304		1	1					0	0	1	1					1	
0305		1		1		1		0	0	1	1						1
0401		1					1	1	0	1	0		1				
0402					1	1		0	0	1	1						1
0403		1		1	1	1		0	0	1	1						1
0404		1	1					1	0	1	0						1
0405		1	1	1	1	1		1	0	1	0		1	1			
0501			1					0	1	1	0			1			
0502			1					1	1	0	0		1	1			
0503		1	1				1	0	1	0	0	1					
0504		1	1	1				1	0	1	1		1				
0505		1					1	0	1	1	0	1					
0506		1	1				1	0	1	1	1		1				
0507			1				1	1	1	1	0		1				
0508			1	1				1	0	1	0		1				
0509			1					1	0	1	0		1				
0510			1					1	0	0	0		1				
0511			1					1	0	0	0		1				
0512			1					1	1	0	0		1				

0601		1						0	1	1	1	1					
0602		1	1					0	1	1	1	1					
0603		1						0	1	0	1	1				1	
0604		1						0	1	1	1				1		1
0605		1						0	1	1	1	1					
0701		1						1	0	0	0		1				
0702		1						1	0	0	0		1				
0703			1					1	0	0	0		1				
0704			1					1	0	0	0		1				
0705		1	1					1	0	1	1		1				
0706		1	1					1	0	1	0		1				
0801		1	1					0	1	1	1	1	1	1	1		
0802		1	1					0	1	1	1	1					
0900		1						1	0	1	0				1		1
1001		1	1					1	0	1	1		1	1		1	
1002		1	1					1	1	0	0		1	1			
1101	1	1	1		1			1	1	0	0		1				
1201	1				1			1	1	0	0	1					
1202			1					1	1	1	0		1	1			
1203			1					1	1	1	0		1				
1204		1			1		1	1	1	1	1		1				
1301		1	1					0	1	1	0			1			
1302		1			1			1	1	1	1	1	1				

1303	1	1	1		1			1	1	1	0	1	1				
1401		1						0	1	0	1	1					
1402		1		1				0	0	1	0						1
1403		1		1				0	0	1	0						1
1501		1		1	1			0	0	1	0						1
1502		1						1	1	0	0	1					
1503		1	1					1	0	0	0		1				1
1504		1	1					0	1	1	0		1	1			
1601	1	1			1	1		1	1	0	0	1			1		
1602	1	1			1			1	1	1	1	1	1	1	1	1	
1603	1	1			1			1	1	1	0	1		1	1		
1604	1	1			1			1	1	1	1	1			1	1	
1605	1	1			1			1	1	1	1	1					
1606	1	1			1			0	1	1	0	1	1		1		
1701		1					1	1	1	0	0		1	1			
1702		1						0	1	0	0	1					
1703	1	1			1			0	1	0	0	1					
1704		1			1			0	1	0	0	1					
1705		1			1			1	0	0	0	1					
1801		1						1	0	0	0				1		
1802		1						0	0	1 voting system	0						
1803	1	1						0	1	0	0	1					

1804		1						1	1	0	0	1					
1901	1	1					1	0	1	1	0	1					1
1902	1	1						1	0	1	0						1
1903			1					1	0	0	0		1		1		
1904		1			1	1		0	0	1	1						1
1905		1				1		1	1	1	0	1	1				1
2001			1					1	0	1	1		1				
2002		1		1				0	0	1	0						1
2003		1	1					1	1	1	0	1					1
2004		1	1					0	0	1	1						1
2005			1					0	1	1	0			1			
2101		1		1				0	0	1	0						1
2102		1		1				0	0	1	0						1
2103		1						0	0	1	0						1
2104		1		1				0	0	1	0						1
2105		1		1				0	0	1	0						1
2201		1						1	1	1	0		1				1
2202		1	1					1	1	1	0		1				
2203		1						0	1	1	0	1					
2204	1	1		1	1			1	1	1	0	1					1
2205	1	1	1	1	1			0	1	1	0	1			1		1
2301		1	1					0	0	1	0						1
2302			1		1			1	0	0	0	1					

2303		1		1		1		0	0	1	0						1
2304		1		1		1		0	0	1	0						1
2305		1	1					0	1	1	0						1
2401		1	1					1	1	0	0	1	1				
2402		1	1	1				1	1	0	1	1	1				
2403		1	1					1	1	0	1	1	1				
2404		1						1	1	1	0	1	1		1		
2405	1	1				1		1	1	0	0	1	1				
2501	1	1			1			0	1	1	1	1					
2502	1	1			1			0	1	1	0	1					
2503	1	1			1			0	1	1	1	1					
2504	1	1	1	1	1		1	1	1	0	1	1	1		1		
2505			1				1	1	1	1	1	1	1				
2601		1	1					0	1	0	0	1					
2602		1		1		1		0	1	1	0	1					
2603		1	1			1		1	1	1	0		1				
2604		1	1					0	1	1	0	1	1				
2605		1	1					1	0	1	0						1
Occurrence (over 118 VC)	23	97	55	24	29	14	10	65	67	81	35	47	51	19	16	5	34

4. Discussion

For most of the selected value chains (97/118), the sustainable innovation involved farmers or a producer organisation. For less than half of the value chains, the sustainable innovations involved food industry or retailers. The other types of partners, like technology providers, consumers or civil society, NGOs, associations, public agencies and research institutes or private consultants, are secondary in the selected value chains. Regarding the types of innovations both product and process innovations (including farming practices and food processing), as well as organisational innovations are well represented.

We summarize the inventoried SOI in 6 categories, described hereafter. These innovations are not exclusive and are sometimes combined as “building blocks” in a SOI process at the value chain level.

4.1. Implementing new farming techniques and technologies

Value chains number: 0104, 0302, 0503, 0505, 0601, 0602, 0603, 0605, 0801, 0802, 1201, 1302, 1303, 1401,1403, 1502, 1601, 1602, 1603, 1604, 1605, 1606, 1702, 1703, 1704, 1705, 1803, 1804, 1901, 1905, 2003, 2203, 2204, 2205, 2401, 2402, 2403, 2404, 2405, 2501, 2502, 2503, 2504, 2505, 2601, 2602, 2604.

First, the SOI concerns mature value chains and aims at improving the existing farming techniques (crop protection, fertilization, irrigation, soil management, biodiversity protection). It can imply a partial conversion or a complete switch to *organic farming* (0801,1401), the development of *permaculture* techniques (1905) or the progressive implementation of *environmentally friendly practices*. The implementation of such technical innovations on the farm involves collaboration between farmers, producer organizations, and interprofessional unions, but also inputs suppliers and technological providers, as well as research institutes. These new practices can be institutionalized through private brand or certifications like the BE CLIMATE brand (2001) or Demain La Terre (0802), or through standards such as the Integrated production norm UNI 11233 (0602), the GLOBAL G.A.P.(0603), or public quality certification scheme (Protected Designation of Origin) (0601).

These new farming techniques include:

- the implementation of *Integrated Crop Protection Management* techniques.

For instance, the use of *biological plant protection products* using virus or bacteria, in apple orchard (1401, 1804); improved *propagation material* for garlic production (0601) or new *grafting technique* on material reproduced by meristematic way (1704).

- innovations related to *crop diversification* and *genetic selection*.

In France, the development of legume grain production, such as fababean for feed, require genetic selection effort, for instance to reduce level of vicine/ convicine in the grains (1403). In the Netherlands, structuring a quinoa value chain requires to develop new variety adapted to the Dutch microclimate and the final use. Notably, to select variety with low level of saponine to make the cooking experience for consumers more convenient (1201).In the same line, the introduction of diversification species, such as kiwi in Hungarian farming, or persimmon in Spanish farming , requires some selection of varieties adapted to the microclimate (1502, 1605). Finally the selection of variety tolerant to main plant diseases is also at stake to reduce phytosanitary treatment, for instance for vine genotypes in Italy (1705).

- the implementation of *Smart Farming Practices*

This cross-cutting innovation concerns Decision Support System for helping farmers in their pest management, fertilization and irrigation choices, and Precision Farming to adjust and control such operations (0602, 0603, 1602). For instance in vineyard, the design and development of a variable rate atomizer able to recover the unsuccessful pest chemical treatment, the installation of a system to combat frosts (mobile wind blade and artificial fog generator), and the installation of a precision irrigation system (1703).

- the implementation of *biodiversity conservation practices*

It consists of Conservation Action Plans (PAC) for evaluating the natural or semi-natural areas and cataloging the flora and fauna species existing on the farm, and in the subsequent definition of practical recommendations to manage, recover and value biodiversity in these areas (1803). As an illustration, these practices to preserve biodiversity include setting beehives in orchard to maximize pollination (0801) installing reptile reservoirs, wild boar ponds, bat hotels as a method of pest control, planting native species in unproductive areas of the farm, planting of flower strips on the margins of the farms and between crops (1803)

- the adoption of *renewable energy*

For instance the implementation of on-site cogeneration plant and installation of photovoltaic system (0104).

Second, the SOI concerns new models of farming system in emerging value chains.

Vertical farming (0503, 1702,1901,2003), *micro-farm network* (0505) or *circle farming Ecology zone concept* (2204) are examples of such SOIs. These production systems are highly intensive in technology (precision farming with sensors and automatization) and low or zero pesticides. They are often conceptualized as modular farms which development could be easily scalable and rapidly deployable (0505,2003,2204).

4.2. Implementing new food products for healthier diet

Value chains number: 0102, 0103, 0104, 0105, 0201, 0303, 0401, 0405, 0502, 0504, 0506, 0507, 0508, 0509, 0510, 0511, 0512, 0701, 0702, 0703, 0704, 0705, 0706, 0801, 1001, 1002, 1101, 1202, 1203, 1204, 1302, 1303, 1503, 1504, 1602, 1606, 1701, 1903, 1905, 2001, 2201, 2202, 2401, 2402, 2403, 2404, 2405, 2504, 2505, 2603, 2604.

First, the sustainability-oriented innovation consists in developing **innovative healthy products made from fruits and vegetables**. It can be *ready-to eat snack made of dehydrated fruits*; but also *protein plant-based meal or ingredient* (meat and dairies analogue or not). These food innovations respond to the call for a more diversified diets, less animal protein intakes, as well as less fatty and sugary food. They also bring convenient cooking solutions for time-constrained consumers (0504,0512) that still want to cook their own meal. These SOIs concern mature value chain that made incremental change, for instance reducing added sugar in fruit juice (0801) or emerging value chains based on more radical innovative concepts developed by start-up (0507). These food innovations (in both the products and the process) are generally leaded by food industry processors, and sometimes involve stronger collaboration with the producers of the crop, in order to develop adequate raw material supply (0303, 0504). Collaboration with the consumers are developed as well in order to formulate original recipes (0508) or benefit from crowdfunding (0504). The food innovation can also come directly from farmers that diversify their activities and invest in the transformation stage to create and capture more value (0201, 1204,2201).These new products also represents an opportunity for using F&V that cannot be used in fresh market outlet. Therefore, these food innovations may combined with organisational and technological innovations for valorising residues or “non-standard/downgraded” F&V (see 3.2.4).

Second, the SOI consists in proposing **new superfood ingredients**, like spirulina (2604) and sea buckthorn (2505).

Finally, these innovations can be based on the **revalorization of traditional quality products**; with the development of an institutional recognition or a new niche market strategy. For instance, the recognition of fermented cabbage in the tradition product list in by the polish Ministry of agriculture in 2006 (0705) or the valorisation of olive oil in niche export market (2504).

4.3. Implementing new food packaging systems

Value chains number: 0202, 0204, 0301, 0604, 0801, 0900, 1601, 1602, 1603, 1604, 1606, 1801, 1903, 2205, 2404, 2504.

First, several SOI aims at implementing or developing *packaging alternatives to plastic*. It includes using glass bottle instead of plastic one, using recycled PET, 100% compostable/biodegradable material such as paper

and cardboard , cellulose film or wood pulp (0603, 0604, 0900, 1601, 1602, 1603, 1604, 1606, 1801, 2205, 2404).

Second, SOI includes the implementation of *deposit systems* where consumer can be rewarded while giving back the packaging to the company (0202).

Third, the reduction of packaging can go hand in hand with the implementation of *Augmented Reality System* (ARS). The ARS represents an innovative packaging solution that allows food industries to communicate sustainability messages (for example the recyclability of packaging or other additional information) through real and virtual elements displayed with an App interface, in overlay and in real time (Video, Info Recycling, Social, Games, Multimedia Elements). It is a service to the supply chain that can be applied to any packaged food (F&V, animal derivatives, etc.). One application in the F&V sector is Santal fruit juice (0301). This is a completely new way of presenting the information to consumers. The experience lived by the user can also become a vehicle for collecting information and data on consumer preferences and behaviours. This innovation rely on collaboration between food industry and technological providers, and research institutes.

4.4. Organizing the value chain for food waste reduction and valorization of residual streams

Value chains number: 0101, 0102, 0103, 0104, 0105, 0201, 0405, 0501, 0502, 0801, 1001, 1002, 1202, 1301, 1504, 1602, 1603, 1701, 2005.

First, the SOI consists in using *co/by-products of food industry*. Residues from F&V processing can be of interest and valorised as high-value products. To do so, collaboration between different organisations are required. As an illustration, in the Navarra region in Spain, more that 250 wineries are associated in a cooperative for transforming the by-products of wine-making in high-added value ingredients for cosmetics or nutraceuticals (0102). At a smaller scale, in the Vallagarino region in Italy, a social enterprise collaborate with a producer organisation and a bakery, to revalorize the orange pulp that was a co-product of the fabrication of candied orange (1001). In addition to that initiatives in the F&V sector, some SOI consist in reusing co/by products coming from other types of crops. The cereals spent grains (malted and mashed grains) from breweries are for instance revalorized as flour for no-gluten bread by bakery in Spain (0105) or by food start-up in Denmark (0502). Coffee streams are also revalorized as substrate to produce mushrooms; which involve tight collaboration between collectivities and restaurants and some innovative enterprises, either food startup in Denmark (0501) or social cooperative in Belgium (2005).

Second, the SOI consists in organizing new valorization channels for *“ugly and imperfect” F&V that do not comply with standardized requirements of the regular market* or for *F&V production surplus and leftover*. It can be a private-owned processor, that transforms F&V from local producers into powders for food or cosmetic industries , and that delivers its products through a centralised digital platform (0103). It can also be a multistakeholder collaboration involving producer organisations, processors, public agencies, and social food aids organisations. In that case, the F&V are transformed, for instance in soups, and then both sold in retails shops (for instance through the brand “Es im-perfect”) and distributed through Food Aid associations. (0101, 0405). Finally, it can also be a farmer or groups of farmers, that create their own enterprise to process the part of F&V production that cannot be sold fresh, such as for apple (1301) or pumpkin (0201).

Third, the SOI consists in optimizing the value chain to *reduce waste during the food process* in itself. For instance by adapting the machines during oil processing (1504) or using a process that transform part of prickly pear, including peels and leaves (1002).

4.5. Improving seasonal workers living conditions

Value chains number: 0304, 0603, 1001, 1602, 1604.

The fruit & vegetable sector requires a large number of seasonal workers. Social justice and ethical concerns are at stake related to the exploitation of seasonal and migrant workers. This phenomenon of “modern slavery” is present in Southern Italy, notably in the tomato value chain, but somehow hidden in a system that benefits from economizing on the cost of labour. Some value chains then tackle this issue, by reorganizing the relation between producers, food industry and retailers through deeper coordination and control,

guaranteeing decent working conditions and revenues/wages. In Spain, similar challenges exist in the tomato value chains, and some leading organization takes actions in favor of seasonal migrants (1602, 1604). At the same time, institutional innovation is done through new branding and certifications to make this phenomenon visible to the consumers, and guarantee a sustainable alternative, for instance with the NoCAP brand in Italy (0304) or through international standard guaranteeing good working conditions such as GRASP (GLOBALG.A.P Risk Assessment on Social Practice) (0603, 1602).

4.6. Shortening the value chain / Bringing producers and consumers together

Value chains number: 0203, 0204, 0205, 0302, 0305, 0402, 0403, 0404, 0604, 0900, 1402, 1403, 1501, 1503, 1901, 1902, 1904, 1905, 2002, 2003, 2004, 2101, 2102, 2103, 2104, 2105, 2201, 2204, 2205, 2301, 2303, 2304, 2305, 2605.

In our inventory, several SOI aimed at bringing producers and consumers together, or at least reducing the number of intermediaries between them.

First, the SOI concerns the *Community Supported Agriculture* system, referring to a collaboration between farmers and consumers, where an agreement before the production is done (0203, 0302, 0305, 0402, 0403, 1501, 2204, 2205, 2303). Consumers commit to buy the F&V on a regular predefined basis (quantity and price) and are sometimes also providing occasional work force, on a voluntary basis (most of the time for harvesting). While this CSA model is not new, some initiatives try to scale up this CSA model to the regional level (0302, 0305). In these cases, the SOI often rely on public organisations like municipalities, that also take part in the collaboration (in addition to consumers and producers), and on a progressive institutionalisation of these collaborations. For instance, with the institutionalisation of the 'biodistrict' in a regional Italian law (0302), or the structuration of international CSA network (0203). These CSA models can also be a lever of inclusion of disabled people (0402, 0604)

Second, the SOI concerns *digital platform* enabling to create a network of farmers that sell their products directly to the individual consumers or restaurants (0404, 0604, 1902, 2103, 2301). Short food supply chain relying on a network of farmers enable to provide a broader variety of products, compared to direct selling or CSA involving just one farm and consumers³. However, one challenge for the success of the farmers shop is that farmers must dedicate/allocate resources for the marketing/selling activities. Therefore digital or e-commerce platforms, also called on-line market software, constitute an interesting alternative to dematerialise the act of selling and buying. These platforms can be private-owned and managed by an intermediary organisation that puts in relation small scale farmers and consumers; and insures the delivery (0204, 0900, 1902), for instance by cargo (2305); or involves more directly the farmers in the ownership and governance of the platform, and the delivery of products to the consumers (0205). For reducing the selling and delivery time for farmers, *fully automated physical supermarkets* also appear as a new option (0404). The SOI consist in digitalising the act of selling, with a fully automated shop, open 24/7. The act of buying and selling is done through smartphone with a QR code scan system, and specific shelves (with weighting sensor). As a result, there is no cash registers, no queues, and no large crowds, enabling the customers to shop during off-peak hours of the day, without requiring personal contact with a shop assistant. Finally, if both these SOI contribute to reducing intermediaries they may involve few social or no social interactions between producers and consumers.

Third, the development of *food cooperatives*, also called *cooperative or participative supermarkets* constitute another type of SOI (1402, 1403, 2101, 2102, 2104, 2105, 2304). In these cases, collaboration involves producers, workers and consumers. Different governance models are used. Most often, the citizens/consumers work voluntarily a few hours a month to insure the functioning of the supermarket. Then, these supermarkets may be limited to members only or be open to non-members.

³ In the latter case, the boxes are based on seasonality and the consumer do not have the choice of the composition of the basket.

5. Conclusion

This deliverable presents the results of the Task1.2 inventory of sustainable and innovative value chains in Europe. Based on the operationalization of the concept of Sustainable-Oriented Innovation (SOI) as defined in D1.1, the CO-FRESH partners were able to gather more than 100 value chains where innovation toward higher levels of sustainability were implemented. The list of 100+ value chains presents a diversity of fruit and vegetable value chains, both long and short, where fresh or processed products are valorised. The type of innovations at stake include both product, process, organisational (including managerial) and institutional innovations, involving a diversity of actors. In this inventory, most of the innovations involve farmers and producer organisations (97/118), but more than a half also involve the food industry and the retailers. Other stakeholders such as inputs suppliers, consumers, government agencies and research institutes, private consultants were also taking part in these innovations, but to a lower degree.

A description of all innovations was provided by categorizing them into 6 types:

- 1) Implementing new farming techniques and technologies
- 2) Implementing new food products for healthier diet
- 3) Implementing new food packaging systems
- 4) Organizing the value chain for food waste reduction and valorization of residual streams
- 5) Improving seasonal workers living conditions
- 6) Shortening the value chain/ bringing producers and consumers together.

These categories are not exclusive and may constitute 'building blocks' that can be combined in a SOI process in the value chain. Therefore, the data set we created in this inventory provides an overview of the diversity of initiatives taking place in F&V value chains. In the next step of the project, further data collection will be carried out in each value chain, through a survey addressed to the organisation leading the SOI process. The selected value chains, thus, constitute a rich pool to explore the drivers of SOIs and their success factors. Among the success factors, special attention will be paid to the internal drivers, the management of the collaboration, and the public policies. Finally, at this stage, the sustainability impact of the innovation was *a priori* assessed thanks to the expertise of each CO-FRESH partner and public available data about the value chain, but the survey will provide a finer assessment of the impact of these SOI on the three dimensions of sustainability: environmental, social and economic.

Annexes

Annex 1. INSTRUCTIONS and SELECTION CRITERIA used for Task1.2 Inventory

INSTRUCTIONS

Each CO-FRESH partner is invited to identify and inform about at least five fruit & vegetable (F&V) value chains. This activity is part of WP1.Task 1.2. *Identify innovative agrifood value chains and collect empirical data.*

Confidentiality: The data collected during this inventory will be used in the Deliverable D1.2. which dissemination level is public. The inventory will be shared on the Nextcloud platform, all CO-FRESH members partners will be granted access to it. Any personal data that will be provided during this inventory will be kept confidential. If any other provided data should remain confidential, please explicitly mention it.

You will find below all the information you need to start the inventory. If some doubts remain after reading, do not hesitate to contact us and we will explain !

What kind of value chains do we target in the CO-FRESH inventory ?

The inventory scope encompasses fruit and vegetable (including grain-legume) productions for food, from any European countries, independently of the type of products (processed and fresh) and the type of value chains (short, long, circular). To be included in the inventory, **the key criteria is that a sustainability-oriented innovation has been implemented in the value chain since at least one year.**

What do we mean by sustainability-oriented innovation ?

In the CO-FRESH project, we define a **sustainability-oriented innovation** as:

a collaborative process of change directed at improving one or more of the three pillars of sustainability (namely environmental, economical and social), relying on a diversity of bundled innovations (notably technical, organizational and institutional), and whose benefits are fairly distributed along the value-chains actors

By **technical innovation**, we refer to the implementation of new or significantly improved goods and services, or new or improved methods of producing goods and services. For instance, diversifying a crop rotation, modifying the recipe of a food product, improving the packaging, using new sensors in crop production.

By **organizational innovation** we refer to the implementation of new routines, management structures and methods of coordination within or between organizations. Managerial innovation is a form of organizational innovation focused on the specific roles and functions of the manager. Examples include changing the sourcing strategy of the company, using new contracts, organizing a farmer group for selling products, or changing the internal structure of the company.

By **institutional innovation**, we refer to a legitimate change in the cognitive, normative, or regulative rules of a social system. Illustrations could be new certifications for products, new rules for labour conditions, new regulations about F&V consumption in catering.

What do we mean by value chain ?

In the CO-FRESH project, we define a **value chain** as:

the sequence of activities, and the organisations carrying out these activities, that generate, transform and distribute products before they reach the final customer.

The **organisations** may include farms, farmers groups or cooperatives, inputs suppliers, processors, traders, retailers, consumers groups.

The sequence of activities may differ according to the value chain, but generally includes:

- inputs supply: the provision of products, such as seeds or fertilizers, that are used by farmers for crop production
- crop production: the growing of the crop by farmers or agribusinesses
- transformation: the technological processing of a raw material (entire crop or part of it) to transform it into an ingredient or a food product
- commercialization: the marketing of the final product to consumers
- consumption: the purchase and use of the final product by consumers

How should you proceed for the inventory ?

Based on your expertise of the F&V sector, please identify F&V value chains that meet all of the following conditions and then please fill in the template:

Has a SOI been implemented in the value chain since at least one year?

↓ YES ↓

Is the SOI oriented toward at least two of the three pillars of sustainability (environmental, economical and social)?

↓ YES ↓

Does the SOI involve at least two types of innovations (technical, organisational and institutional innovations)?

↓ YES ↓

Does the SOI involve the participation of at least two organizations of the value chain, preferably including farmers?

↓ YES ↓

Does the SOI have benefits for at least two organizations in the value chain, preferably including farmers?

↓ YES ↓

Please fill in the template.

Try to diversify as much as possible the value chains you will inform, with a mix of fruit, vegetable and grain-legume value chains, with a variety of final products (fresh and processed food), and with a variety

of value chain types (short, intermediate, long or circular). You should also focus on the value chains you know the best.

For each of the five value chains you have identified, give a name to the value chain and fill in one template (WORD document). The template can be completed by you alone or with the help of a value chain representative. Use as many words as you want. Save the document by giving it a name with the following format: Co-FRESH partner short name _value chain name.doc

Send the 5 value chains completed templates, preferably before the 27th of May 2021, to celia.cholez@wur.nl

Thank you for your help.

Annex 2. VALUE CHAIN Template used for Task1.2 Inventory

VALUE CHAIN: *give a name***Final product:**

Describe the food product and indicate its degree of processing (fresh, minimally processed, processed, semi-preserves, preserves)

Country(ies) of sale of the final product:**Country(ies) of production of the crop:****Description of the value chain:**

Describe the activities and the main organisations involved in the Table below⁴.

Activities	Description and main organisations involved
Inputs supply	
Crop production	
Transformation	
Commercialization	
Consumption	

Sustainability-oriented innovation (SOI) in the value chain (VC):

Describe the SOI in the Table below.

SOI dimensions	Description
What types of innovation ⁵ were implemented in the VC ?	
What were the objectives ⁶ of such innovation(s) ?	
What organisation(s) led the SOI process ?	
What organisations participated in the SOI process ?	
What were the benefits ⁷ and the beneficiaries of the SOI ?	

Contact:

Could you share at least one contact in the value chain that we could further reach for additional data collection? Please, preferably target actors that led the SOI implementation or at least participated in the SOI process.

⁴ See the Instructions form for definitions of “activities” and “organisations”. Feel free to add activities if needed.

⁵ The type of innovation refers to technical, organisational and institutional innovation. See the Instructions form for definitions.

⁶ The objectives relate to the pillars of sustainability namely environmental, economical and social.

⁷ The benefits relate to the economical, environmental and social improvements. The beneficiaries may be organisations of the value chains as well as external organisations.

Contact person	Organisation	Previous collaboration
Indicate: - name of the person - function in the organization - email or phone number	Indicate: - the name of the organisation - its type (farmers organization, SME, large enterprise, NGO, research institutes, other...) - its headquarter location - its size (number of members or turnover) - its age (<2 yrs; 2 to 5yrs; 5 to 10 yrs; >10yrs)	Indicate if you previously worked with this organization and for what purpose

Links:

Please, share any webpages or other relevant links related to the VC.