LOWINFOOD

Multi-actor design of low-waste food value chains through the demonstration of innovative solutions to reduce food loss and waste

GA No. 101000439

D6.10 Recommendations for the diffusion of innovations against FLW

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LOWINFOOD Consortium

N.	Full name of the organisation	Short name	Country
1	Università degli Studi della Tuscia	UNITUS	Italy
2	Alma Mater Studiorum Università di Bologna	UNIBO	Italy
3	Sveriges Lantbruksuniversitet	SLU	Sweden
4	FH Munster University of Applied Sciences	ISUN	Germany
5	The James Hutton Institute	JHI	United Kingdom
6	Universitaet Fuer Bodenkultur Wien	BOKU	Austria
7	Tampereen Korkeakoulusaatio SR	TAU	Finland
8	Charokopeio Panepistimio	HUA	Greece
9	Osterreichisches Okologieinstitut	AIE	Austria
10	Elhuyar Fundazioa	ELH	Spain
11	Matomatic AB	MATO	Sweden
12	Unverschwendet GmbH	UNV	Austria
13	Akademie Deutsches Baeckerhandwerknord GGmbH	ADB	Germany
14	Foresightee (terminated on 30/01/2023)	FOR	Belgium
15	Leroma GmbH	LER	Germany
16	Mitakus Analytics UG	MITA	Germany
17	Kitro SA	KITRO	Switzerland
18	Regione Emilia Romagna	RER	Italy
19	Pianeta Cospea srl	PICO	Italy
20	Cogzum Bulgaria OOD	COZ	Bulgaria
21	Uppsala Kommun	UPP	Sweden
22	Recuperiamo srl	REG	Italy
23	Antegon GmbH	FT	Germany
24	Confederazione Nazionale dell'Artigianato e della piccola e media impresa Associazione di Viterbo e Civitavecchia	CNA	Italy
25	Assemblee des Regions Europeennes Fruitieres Legumieres et Horticoles	ARE	France
26	L.V.L Anonymi Emporiki Toyristiki Kksenodoxeiaki Kataskevastiki Etaireia	BLU	Greece
27	Iridanos-Inabelos Anonymi Etaireiatouristikes Ksenodoxeiakes Kai Agrotikes Epixeiriseis	THA	Greece
28	Luonnonvarakeskus (started on 01/11/2023)	LUKE	Finland

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Table of contents

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Summary

The Sustainable Development Goals (12.3), the EU policy agenda under the Circular Economy Action Plan and the Green Deal within the Farm to Fork Strategy all recognize food loss and waste (FLW) as a worldwide issue that must urgently be addressed. By supporting the demonstration of a portfolio of innovations against FLW in a set of real value chains, the LOWINFOOD project is dedicated to co-designing low-waste value chains in collaboration with food chain players. Learning from the demonstration of the LOWINFOOD innovations, this deliverable reports the policy and market recommendations for the diffusion of sustainable and competitive innovations that reduce FLW in real value chains, that are defined as part of task 6.6 of the project. The result is a toolbox addressed to policy makers, and more in general to stakeholders, containing six strategies to foster the diffusion of innovations to reduce FLW. Each strategy meets a need related to a barrier, is relevant for a specific phase of the value chain and should be implemented at a specific governance territorial scale. The potential impact and feasibility of each strategy is also indicated.

The first two sections of the deliverable detail the objectives and the methodology carried out in order to obtain the results, which are described in the third section. The fourth section is dedicated to the discussion and the policy implications. The deliverable ends with brief conclusions.

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Introduction to the deliverable

LOWINFOOD is a project committed to co-design, together with actors of the food chain, low-waste value chains by supporting the demonstration of a portfolio of innovations in a set of value chains particularly concerned by FLW (fruits & vegetables, bakery products and fish), as well as in at-home and out-of-home consumption. Each of these value chains corresponds to a single Work Package (WP) of the project.

The innovations were selected among promising solutions that have already been developed and tested by some partners of the consortium, with the aim to provide the necessary demonstration and upscale to allow market replication.

The LOWINFOOD consortium comprises 27 entities, located in 12 different countries, and ranging from universities and research institutes to start-ups, foundations, associations, and companies working in the food sector. During the 52 months of the project, the partners were committed to complete 30 tasks and to deliver 60 outputs (deliverables).

The political and regulatory initiatives aiming at reducing food waste are very different across EU Member States, even if they are all implemented within the same general framework which refers to the Commission's new Circular Economy Package and the Directive (EU) 2018/851 of the European Parliament. The objective of this deliverable is to report the activities of task 6.6 which permitted to define common policy recommendations for the diffusion of sustainable and competitive innovations that reduce food waste in real value chains.
Basing on the evidences about the impact of the implementation of innovations, this deliverable focuses on the identification of the levers to facilitate their diffusion, both at the policy and at the market levels.

The LOWINOOD policy recommendations are the result of a long and structured interaction and discussion with the innovators, the WP leaders, external experts of FLW and researchers of the sister projects. This procedure allowed to jointly develop a set of strategies, a toolbox addressed to policy makers and stakeholders operating at different stages of the food value chains, describing the most promising options they have available to address food waste reduction in their operations.

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1. Objectives

The general objective of the research activity was to take the indications deriving from the implementation of the LOWINFOOD innovations and thus identify possible policy strategies that can support the development and the scaling of innovations aiming at reducing FLW along the different value chains.

The specific objectives were:

i. to systematically identify the enablers and barriers experienced by LOWINFOOD innovators in implementing innovative solutions;
ii. to define the potential strategies for overcoming the identified barriers;
iii. to prioritize and validate the identified strategies;
iv. to write clear policy recommendations.

2. Methodology

This deliverable is fed by the results of the demonstration of the LOWINFOOD innovations. Table 2.1 shows an overview of all innovations addressed in the project including their short name and countries, where the innovation was demonstrated. LOWINFOOD's innovations aim to reduce FLW by prevention (e.g. prevention of surplus food at source), re-use (e.g. through food redistribution, food donation) and reprocessing (e.g. reprocessing of surplus food for human consumption), and are therefore situated in the upper halve of the waste hierarchy (Figure 2.1). These innovations have been demonstrated in three value chains that are particularly affected by FLW – bakery, fruits and vegetable, fish – and at the consumption stage, both at households and in the food service environment. The demonstrations took place in 10 different European countries during the years 2021-2024[1].

The lessons learnt by the innovators and actors involved in the demonstrations are used as a base to derive the policy and market recommendations illustrated in this deliverable, by means of a multiple-step methodology. The methodology includes conducting focus groups with the actors involved in the demonstration of the LOWINFOOD innovations to identify the main barriers to the implementation of the innovations, engaging experts in a Delphi study to prioritize the identified strategies and then validating them with LOWINFOOD researchers and the outcomes from other Horizon 2020 sister projects.

[1] More information about the results of the demonstrations is reported in D1.6, D1.7 and D1.8 available at https://lowinfood.eu/project/results/.

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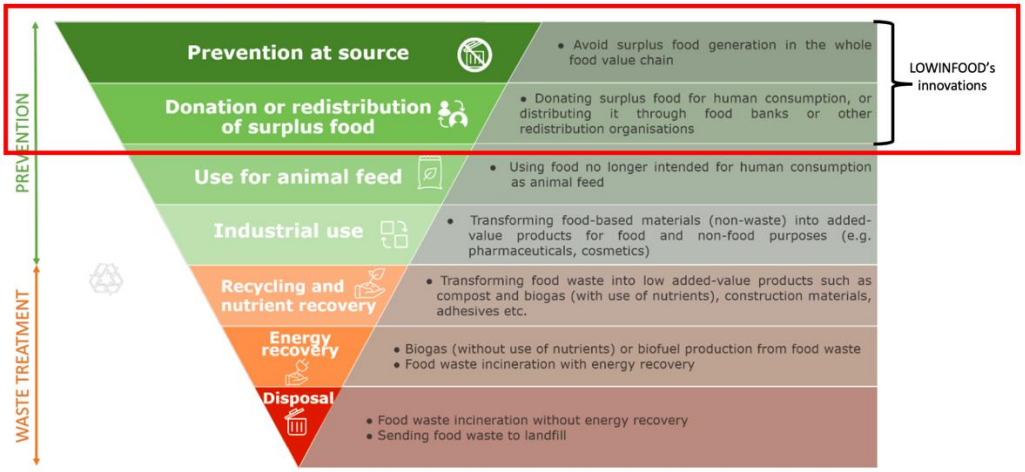
Table 2.1: Overview of LOWINFOOD's demonstration of innovations

WP	Task (T) No.*	Geograph-ical scope	Innovation - Short name
WP2	T 2.1	RO	RER Software for F&V
WP2	T 2.2	AT	UNV Cooperation system for F&V
WP2	T 2.3	DE	Leroma B2B digital marketplace for F&V
WP2	T 2.4	IT	Forecasting software to reduce waste of F&V products
WP3	T 3.1	SE, FI, IT	Supplier-retailer agreements
WP3	T 3.2	SE, FI, IT	Stakeholder dialogue in the bread value chain
WP3	T 3.3	DE	FoodTracks Software for bakeries
WP4	T 4.1	DE, UK	Stakeholder dialogue in the fish value chain
WP4	T 4.2	DE, UK	Leroma B2B digital marketplace for fish
WP5	T 5.1	DE, CH, GR	KITRO Innovative food waste solution
WP5	T 5.2	DE, SE	MITAKUS Forecasting software for restaurants
WP5	T 5.3	DE, SE, AT	MATOMATIC Plate Waste Tracker
WP5	T 5.4	SE, AT	SLU/AIE Holistic educational approach
WP5	T 5.5	FI, AT, GR	CozZo Mobile App
WP5	T 5.6	IT	REGUSTO Mobile App

**AT = Austria, CH = Switzerland, DE = Germany, FI = Finland, GR = Greece, IT = Italy, RO = Romania, SE = Sweden.*
***B.... Baseline measured; D... Demonstration measured; S... Baseline and/or demonstration was simulated[SP5] [NK6]*

Figure 2.1: Hierarchy for prioritisation of options to manage food surplus, by-product from food processing and food waste (JRC, 2024) and corresponding LOWINFOOD innovations



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2.1 Focus groups

A first round of focus groups with the actors involved in the implementation of the innovations were prepared in order to find the barriers they faced. Four parallel focus groups were carried out according to the following four types of actions run within the project:

a. consumer behaviour change
b. food redistribution
c. food waste prevention governance
d. supply chain efficiency

The sessions were held in Münster (Germany) during the General Project Meeting of LOWINFOOD, in December 2023.

A second round of focus groups with the actors involved in the demonstration of the innovations was then held online in May 2024, keeping the same division related to the types of actions, to discuss the possible strategies to overcome the barriers identified in the first round.

In both rounds, the innovators were divided into groups of discussion according to the type of innovation. All sessions lasted about one hour with 5 to 12 participants each.

2.2 Delphi study

The strategies proposed by the innovators in the focus groups have been ranked thanks to 11 experts that between August and September 2024 participated in a Delphi study. The Delphi methodology (Nowak et al., 2011) foresees the administration of different rounds of a questionnaire to a panel of experts, with the aim to gather their opinion on a specific topic, and to let their different opinions converge towards a common estimation or, at least, to reduce the variability across answers.

In order to assess the effectiveness in overcoming the barriers and the feasibility of implementing the strategies at the policy or market level, the experts have been asked to rate (in a 0-10 scale, where 0=no impact and 10=maximum impact) the potential impact and the level of feasibility (in a 0-10 scale, where 0=not feasible at all and 10=very feasible) of the identified strategies. Furthermore, the suitable governance territorial scale to implement the strategies was investigated. Appendix 1 reports the structure of the questionnaire utilized for the Delphi study.

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The first round was concluded in 10 days, followed by a second consultation that focused on the results of the first. This allowed the experts to express their opinions again and decide whether to maintain their divergent views or move toward a more consensual one.

2.3 Validation

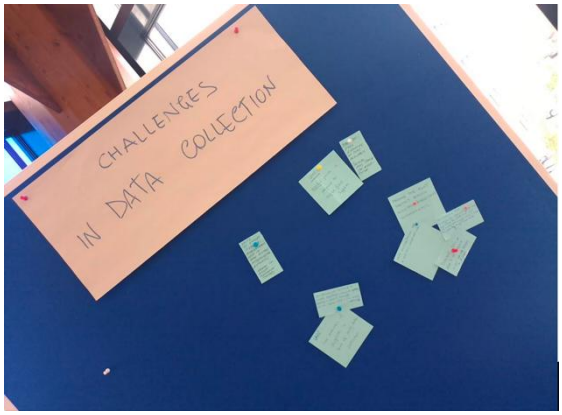
To validate and discuss the findings of the Delphi study, a roundtable with the leaders of the LOWINFOOD work packages focused on the demonstration of innovations (WP2, WP3, WP4 and WP5) was held on September 24th, 2024 in Crete (Greece) during the final General Project meeting. The WP leaders received the outcomes of the Delphi study one week before the roundtable, then they had the opportunity to discuss together some specific issues raised by the moderator of the roundtable.
Moreover, an analysis was carried out to compare the results with the outcomes of the H2020 sister projects.

3. Results

3.1 Barriers

The outcome of the first round of focus groups, held in Münster (Germany) in December 2023 with the actors involved in the demonstration of innovations, is a list of barriers grouped by the type of actions and the level of severity. As it regards the level of severity, the participants classified the barriers using a semantic scale (high, medium and low).

Figure 3.1. Focus groups- Münster (Germany), December 2023.



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The focus group on the **consumer behaviour** type of actions had a participated discussion on the main challenges innovators had to face. The need to constantly motivate users/households and schools was mentioned by every participant. Also keeping engagement rates continuously high during trial phase has been mentioned as a problem for some innovators. Other innovators faced technical or organizational issues. Furthermore, it was agreed and seen as a measure of high importance, that data should be shared between different actors of the supply chain; especially between retailers and consumers for the purpose of having an automated inventory of products at home in a fast and efficient way. A lot of purchase data is collected by retail companies. This type of data should be used not only for company purposes (as primary data) but should be shared with consumers (as secondary source of data) to increase usability of inventory tracking apps. Table 3.1 reports the barriers, and their level of severity, agreed within this focus group.

Table 3.1 – Barriers for "Consumer behaviour change" type of actions

Barrier	Level of severity
Lack in communication between stakeholders	high
Lack of motivation/engagement of stakeholders	high
Lack of accessible data	high
Lack of infrastructure to be more flexible	low
Permission process for visiting and doing research at schools	low
Limited time by teachers	low

Due to the high perishability of fruits, vegetables, and fish by-products, in the focus group on **food redistribution**-related initiatives, innovators agreed that logistics are the primary obstacle to the innovations' actual application. Redistribution is unlikely to be successful if there is not a network of buyers or recipients who can take care of the product right away. The issue facing emerging platforms is that, in the absence of incentive systems, it is hard to find someone that wants to be the first to take the chance of starting a new redistribution process. Among other issues, it was highlighted that redistribution processes need to reach a certain "critical size" in terms of flows of products that can be redistributed, otherwise the actors give up because it may not be worth it economically. Therefore, in transport planning, those who deal with the service should consider this aspect. Table 3.2 reports the barriers, and their level of severity, agreed within this focus group.

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Table 3.2 – Barriers for "Food redistribution" type of actions

Barrier	Level of severity
Lack of relevant network and logistics, related to the fact that fruits and vegetables, as well as fish by-products, are highly perishable	high
"Size" of the redistribution processes, which need to reach a certain volume of flow of products in order to be competitive	high
Lack of knowledge about possible redistribution flows	medium
Food safety and traceability requirements	low

Within the focus group on **prevention governance** type of action innovators agreed that it is difficult to request data or engage in any activity that demands time commitment because the participants in the stakeholder discussion are neither consortium members nor receive immediate financial rewards. There are several obstacles, such as the lack of concrete advantages from sharing data, their formal lack of commitment to do so (they are not consortium partners), their lack of interest in being transparent, the absence of food reduction targets in the law, their reluctance to communicate across supply chain levels due to possible disagreements, their fear of public or official accountability, and their lack of faith in researchers. The obstacles fall into three categories of barriers: trust-related, financial incentive-related and the fact that sustainability is not perceived as an element of the profit function. Table 3.3 reports the barriers, and their level of severity, agreed within this focus group.

Table 3.3 – Barriers for "Prevention governance" type of actions

Barrier	Level of severity
Lack of trust	medium
Lack of incentives	medium
Sustainability is rarely an element of the profit function	medium

The primary obstacles faced by innovators were also discussed in the focus group on **supply chain efficiency** type of actions. The participants presented many problems they detected in the collection of data during the LOWINFOOD project tasks related to the different stakeholders: producers, retailers, processors and innovators. Problems outlined includes lack of awareness among stakeholders, low quality of the data provided, and identifying the needs of the stakeholders. It has been outlined that there is a need for extra effort to establish confidential relationships in order to gain access to data. Additionally, digitizing the data would sometimes help facilitate the work. Table 3.4 reports the barriers, and their level of severity, agreed within this focus group.

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Table 3.4 – Barriers for "Supply chain efficiency" type of actions

Barrier	Level of severity
Lack of trust and awareness	high
Lack of connection to the already existing systems	high
Lack of financial investments for the implementation of new technologies	medium
Not enough concrete business benefits	medium
Competition among the same type of actors	medium

Since some of the barriers are somehow reproduced among the different type of actions, while others can be synthetized in a more general and comprehensive category, we decided to rephrase them in the following four:

i) lack of network among stakeholders;
ii) lack of motivation of entrepreneurs;
iii) lack of motivation of citizens;
iv) lack of data.

3.2 Strategies

In the second round of focus groups, which was held online in May 2024, the actors involved in the implementation of the innovations discussed possible solutions to overcome the barriers identified in the first round. The final outcome consists in the definition of the six following strategies.

A first strategy was identified in order to overcome the barrier identified in the lack of network among stakeholders within the value chains. One possible strategy to overcome this barrier is to **strengthen trade associations and producer organizations (S1)**, (f.i by financial support and facilitating their recognition) so that members can easily share knowledge and establish efficient production standards. The same barrier, if referred only to the category of innovators, can be overcome **supporting new networks of cooperation among innovators (S2)**, so that they can easily share information and data.

Another relevant barrier was identified in the lack of motivation of entrepreneurs, which leads to two possible solutions: providing **incentives for companies that reduce FLW (S3)** (e.g. waste tax reduction) as well as introducing **regulations that force companies to reduce FLW (S4)** (e.g. penalty fee). These are two opposite approaches that in some cases could also coexist.

Focusing on the consumer's side, the main barrier was identified in the lack of motivation of citizens and thus the possible strategy to overcome this barrier is to carry out **public**

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awareness raising and information campaigns (S5) targeted to citizens (e.g. pilot programs in school canteens).

Finally, a barrier transversally recognized and considered particularly limiting is the lack of data in order to use the technology behind the innovations. One possible strategy to overcome this barrier could be to introduce **regulations that force food companies to record data about FLW (S6)**. Indeed, similar regulations already exist in some countries, like Austria and UK, and they are in accordance with the additional rules for the calculation, verification and reporting of data on waste proposed with the actual version of the amended Waste Framework Directive. In this way, for instance, all the support decision-making applications would be accurate and reliable.

3.3 Prioritization

The Delphi study permitted to have a deep analysis of the proposed strategies, which should help policy makers in taking their decisions about an eventual implementation. While evaluating the level of potential impact and feasibility of each strategy, the experts also gave their hints and comments to also highlight the strengths and weaknesses. Table 3.5 reports the mean value and the standard deviation of level attributed to the six strategies in terms of impact and feasibility by the 11 food waste experts (6 researchers and 5 stakeholders of the supply chain). The potential impact was rated on a scale between 0 and 10, where 0=no impact and 10=maximum impact, and the level of feasibility was rated on a scale between 0 and 10, where 0=not feasible at all and 10=very feasible.

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Table 3.5 – Impact and feasibility level of the strategies

n.	Strategy	Barrier to be overcome	**Impact level** (mean value)	**Impact level** (standard deviation)	**Feasibility level** (mean value)	**Feasibility level** (standard deviation)
S1	Strengthen trade associations and producer organizations	lack of network among stakeholders	6.81	0.98	6.00	1.00
S2	Supporting new networks of cooperation among innovators	lack of network among stakeholders	7.09	0.94	5.72	1.35
S3	Incentives for companies that reduce FLW	lack of motivation of entrepreneurs	7.90	0.94	7.18	0.98
S4	Regulations that force companies to reduce FLW	lack of motivation of entrepreneurs	7.81	2.14	6.36	1.80
S5	Public awareness raising and information campaigns	lack of motivation of citizens	6.27	2.05	8.00	1.41
S6	Regulations to record data about FLW	lack of data in order to use the technology behind the innovations	8.27	0.70	8.00	0.77

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Strategy 1 – strengthening trade associations and producer organizations – and **Strategy 2** – fostering cooperation among innovators – both aim to address the lack of networks among stakeholders: the former focuses on the value chain, while the latter targets collaboration among innovators. However, both strategies have lower feasibility levels. Engaging with trade associations and producer organizations is often seen as challenging. Typically, commitments to reduce FLW are made at the higher management levels of the value chain, while at lower decision levels the actors (such as growers, producers, manufacturers, and retailers) may not follow through with the agreed actions. The effectiveness of this strategy is also highly dependent on each organization's ability to engage its members. Moreover, as this strategy mostly concerns cooperation among innovators, the lack of time and trust can be a challenge, as innovators may view each other as competitors. Furthermore, experts have rated the potential impact of this strategy as lower compared to other proposed strategies.

Strategies aimed at overcoming the lack of motivation among entrepreneurs to reduce FLW, specifically **Strategy 3** – offering incentives for companies that reduce FLW- and Strategy 4 – implementing regulations to force companies to reduce FLW – have been evaluated as having a high potential impact, though they differ significantly in feasibility. Incentives are generally seen as more acceptable and promising than punitive measures, although not all experts agree on this. In fact, the feasibility of **Strategy 4** varies widely, likely due to differing cultural approaches across countries. Nevertheless, both strategies may face challenges, such as the need for verification tools to objectively assess FLW reductions.

Strategy 5 - awareness raising/information campaigns – is considered very feasible, but not so effective. The reasons for the very low level of impact attributed by the experts are that motivation through public awareness is really hard to keep in the long term. Probably information campaigns are not sufficient if they are not combined with concrete actions that can empower citizens to reduce FLW.

Strategy 6 - regulations to record data about FLW - is the strategy that is rated the highest both in terms of potential impact and feasibility. The experts pointed out that voluntary approaches to overcome the lack of data in order to use the technology behind the innovations have failed so far. Thus, mandatory regulations seem to be the path to follow. Data will help policy makers and all the actors of the value chain to better understand the issue of FLW and therefore to implement evidence-based strategies.

In order to compare the strategies in terms of their potential impact and feasibility, we put them together in the graph of figure 3.1. Policy makers when choosing the strategies to implement cannot take into account only the potential impact they will have, but often their choices are based on trade-offs with other elements. Indeed, feasibility, in terms of financial, technical and managerial effort, is one element to be considered.

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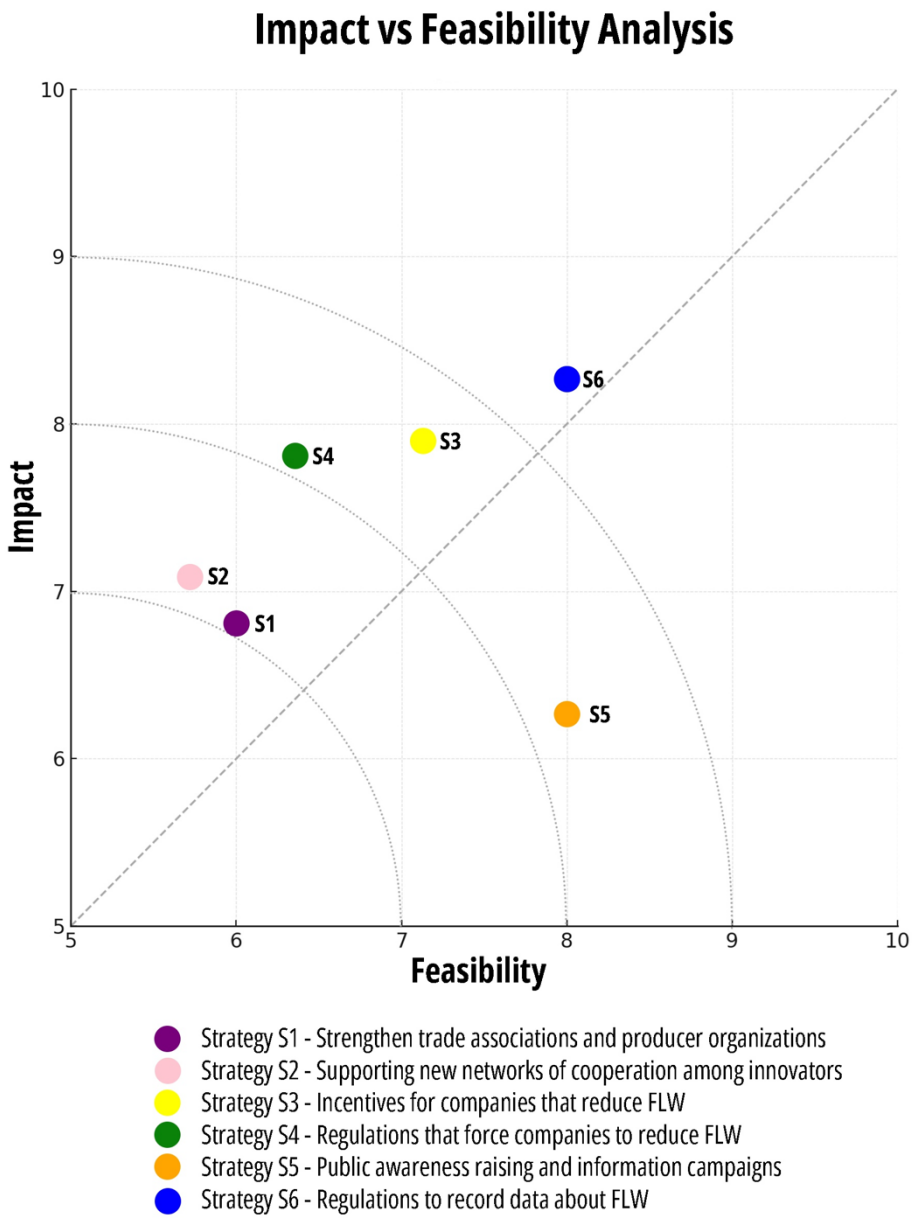
Figure 3.1 – Strategies prioritization



Source: own elaboration.

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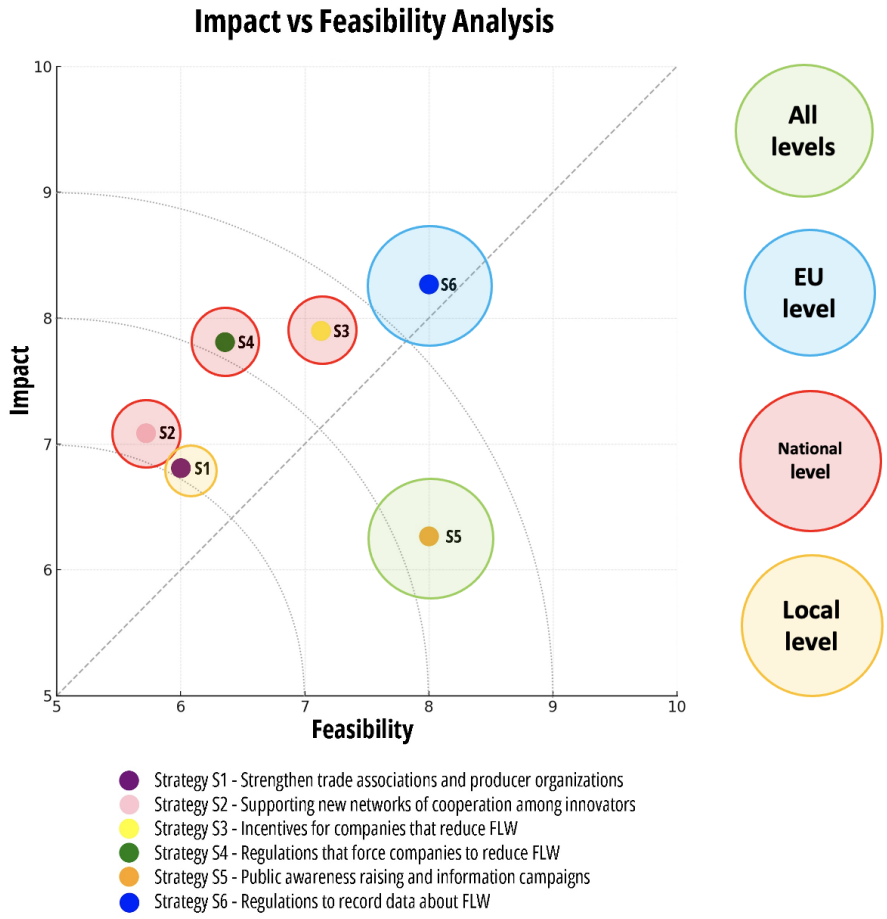
Another aspect to take into account is the governance territorial scale at which the strategy would be more effective. As shown in figure 3.2, the EU level is recommended for strategy 6 - regulations to record data about FLW, while strategies 3 and 4, which should either give incentives to companies that reduce FLW or force them to do it, should be regulated at a national level. Also strategy 2 - cooperation among innovators– should be applied at a national level. Strategy 1, instead, should be implemented at a regional or local level, since trade associations and producer organizations are the direct expression of the territorial context. For the strategy of raising awareness trough public campaigns (S5) the indication is to implement it at all governance levels.

Figure 3.2 – Strategies prioritization with indication of the suitable governance territorial scale



Source: own elaboration.

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3.4 Summary of the results

The results of the research activities carried out permitted to deliver a toolbox addressed to policy makers, and more in general to stakeholders, containing six strategies that can support the development and the scaling of innovations aiming at reducing FLW along the different value chains.

Each strategy meets a need related to a barrier, is relevant for a specific phase of the value chain and should be implemented at a specific governance territorial scale. Furthermore, the potential impact and feasibility level are clearly indicated. They also include some striking quotes of the experts consulted in the Delphi study.

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of network among stakeholders

Relevance

Supply chain efficiency

Strategy S1

Strengthen trade associations and producer organizations

Governance territorial scale

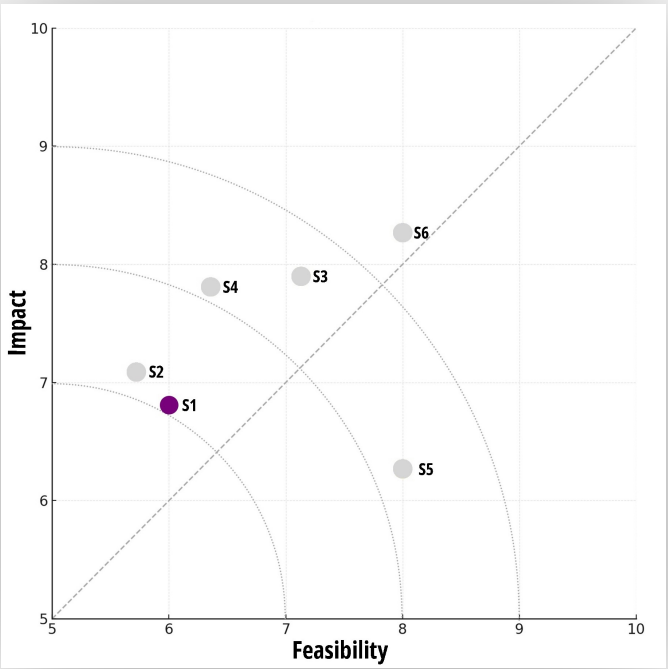
Regional/local

Impact *6.81*

(0=no impact, 10=maximum impact)

Feasibility *6.00*

(0=not feasible, 10=very feasible)



Insights

«available networks do not directly tackle FLW, but should»

«it would be also useful to reinforce links between different types of stakeholders»

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of network among stakeholders

Relevance

Food redistributiom

Strategy S2

Support new networks of cooperation among innovators

Governance territorial scale

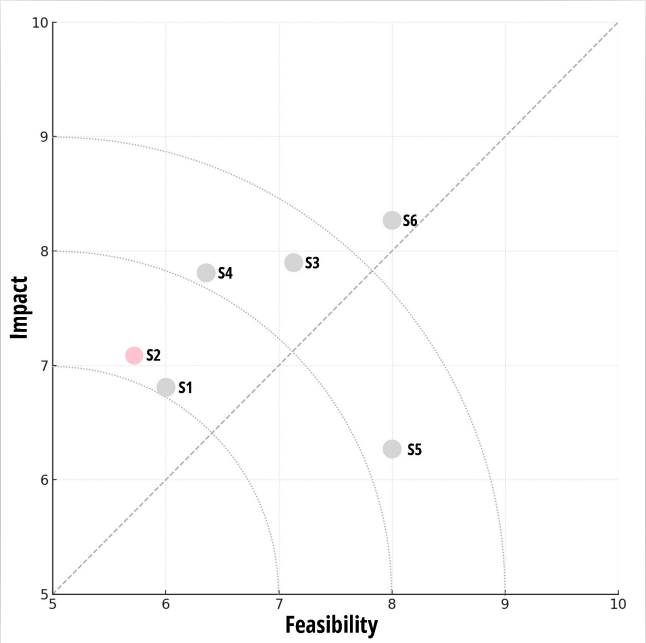
National

Impact *7.09*

(0=no impact, 10=maximum impact)

Feasibility *5.72*

(0=not feasible, 10=very feasible)



Insights

«not easily feasible, because innovators generally want to keep proprietary information»

«the variation in impact of different innovators on FLW may be large»

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of motivation of entrepreneurs

Relevance

Supply chain efficiency

Strategy S3

Incentives for companies that reduce FLW

Governance territorial scale

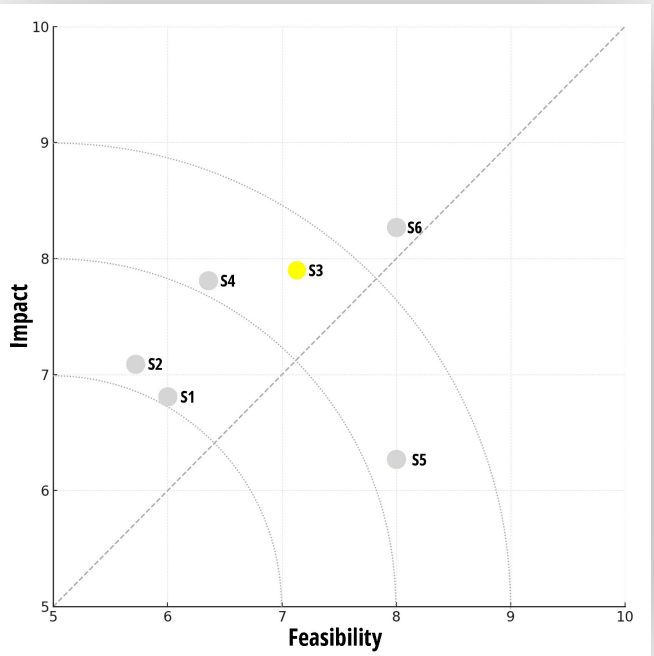
National

Impact *7.90*

(0=no impact, 10=maximum impact)

Feasibility *7.18*

(0=not feasible, 10=very feasible)



Insights

«the definition of waste "reduction" is critical»

«making it more profitable for companies to reduce food waste is a very effective strategy»

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of motivation of entrepreneurs

Relevance

Supply chain efficiency

Strategy S4

Regulations that force companies to reduce FLW

Governance territorial scale

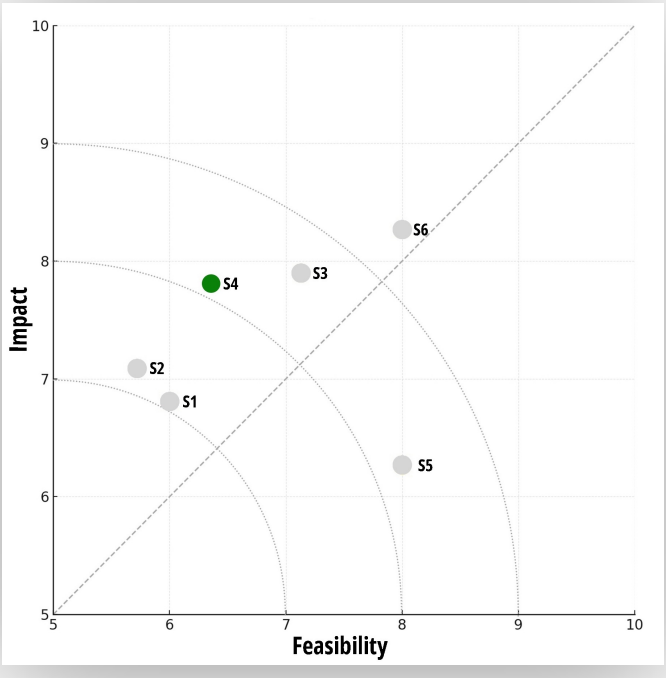
National

Impact *7.81*

(0=no impact, 10=maximum impact)

Feasibility *6.36*

(0=not feasible, 10=very feasible)



Insights

«the definition of waste "reduction" is critical»

«punitive systems can create contradictory incentives»

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of motivation of citizens

Relevance

Consumer behaviour change

Strategy S5

Awareness raising/information campaigns

Governance territorial scale

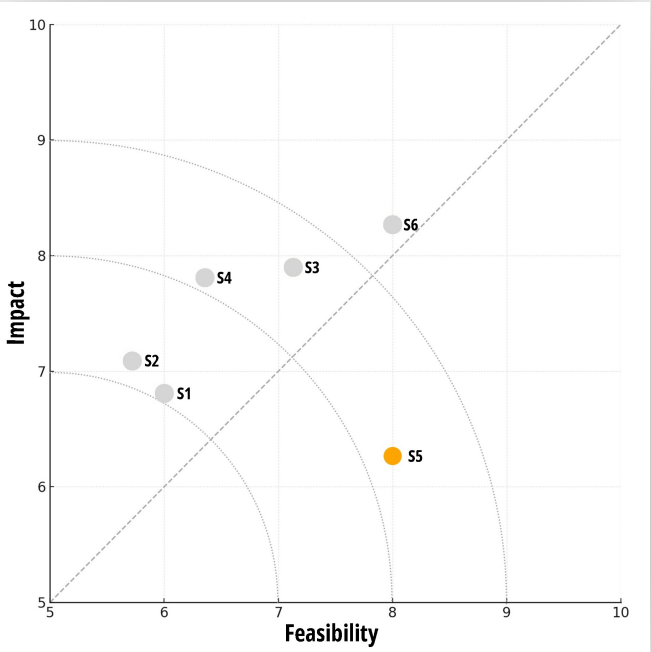
EU, national, regional

Impact *6.27*

(0=no impact, 10=maximum impact)

Feasibility *8.00*

(0=not feasible, 10=very feasible)



Insights

«there is no consistency between motivation, awareness of food waste and actual food waste quantities»

«the potential impact depends on communicating actionable behaviours »

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Recommendations for the diffusion of innovations against food loss and waste

Barrier

Lack of data

Relevance

Prevention governance

Strategy S6

Regulations to record data about FLW

Governance territorial scale

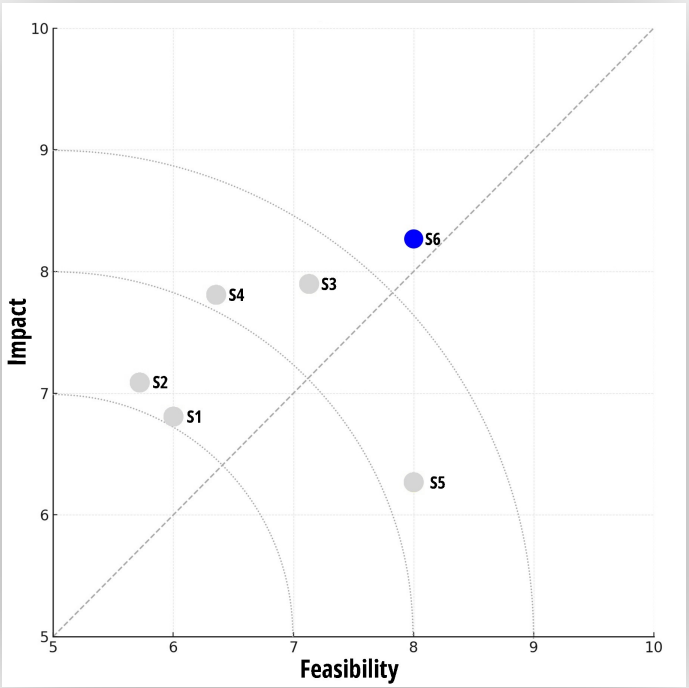
EU

Impact *8.27*

(0=no impact, 10=maximum impact)

Feasibility *8.00*

(0=not feasible, 10=very feasible)



Insights

«mandatory record-keeping [...] is very effective in pushing businesses to prevent food waste»

«standardization of methodologies of data collection is required»

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4. Discussion

4.1 Strategy discussion

The findings highlight several key points. Firstly, the strategy of raising awareness and conducting information campaigns, which is often recommended and considered easy to implement, was found to be less effective compared to other strategies. Some experts believe its impact is relatively low, particularly in the long term. This consideration may derive from the fact that the knowledge about the achievable impact of general awareness campaigns is low due to a lack of evaluation and monitoring. Probably, it would be better to a balance between targeted awareness campaigns (for specific actors and target groups) and general awareness campaigns which fit for all. The first ones might be expensive in relation to the coverage, but the second ones might be too general to really motivate for concrete action. Awareness campaigns are essential to start thinking about the topic but should be completed with additional interventions to facilitate changes on the long-term. Thus, it remains advisable to continue running information campaigns at all levels of governance. Strengthening trade associations and producer organizations and cooperation among innovators, which are also measures already existing in the general policy framework, were considered not very effective and quite hard to be implemented. A critical point that is raised on this strategy concerns the possible benefit for the trade associations and producer organizations in mediating the process of reducing FLW among their members. Furthermore, depending on the competitive situation and level of trust among the members, they might be more or less willing to share their FLW prevention best practices.

The apparently opposite strategies of giving incentives for companies that reduce FLW and implementing regulations that force companies to reduce FLW are both rated as very effective, but their level of feasibility is considered quite different. The former seems to be more acceptable, and thus easier to be implemented, than the second one. Anyhow, the two strategies could also be framed in a complementary system, which sets some mandatory goals in terms of FLW reduction, with fines for the companies that fail to achieve them and, at the same time, awards virtuous companies.

Finally, the implementation of regulations for mandatory FLW data recording emerges as a priority strategy, with the highest impact and also the highest level of feasibility. Indeed, the regulations must be very clear on the recording methods in order to obtain homogeneous and comparable information. To this regard, the existence of an official methodology that sets a common standard for the uniform measurement of levels of food waste in the EU[2], published in 2019, represents an important enabler to make this possible. Depending on the stage of the food supply chain there are methodologies for the in-depth measurement of food waste accepted by the European Commission on which companies should be informed. Within this regard, it would be desirable to train company managers and provide specific

[2] Commission Delegated Decision of May, 3, 2019 supplementing the Directive of the European Parliament and of the Council 2008/98/EC, Official Journal of Laws of the EU L 248/77

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data record formats for the different stages of the supply chain. This could be provided by the associations and POs, especially if strengthened to be able to offer such services. Furthermore, in order to tackle the management process for measuring, reporting and monitoring FLW, companies could apply to specific ISO management standards. For instance, the ISO standard "Standardization of food loss and waste, providing a framework for food organizations" is actually under discussion[3].

4.2 Policy implications

The results of the research activities carried out permitted to deliver a toolbox addressed to policy makers, and more in general to stakeholders, containing six strategies that can support the development and the scaling of innovations aiming at reducing FLW along the different value chains. Indeed, within the EU policy framework there are funds that can be utilized to put into action these strategies. For instance, the ESI Funds for incentives on procedures for collecting and sharing data or the Cohesion Fund or Rural Development Fund to promote collaboration standards to increase awareness and relationships between supply chain actors and civil society. Moreover, the Single Market Programme 2025-2027 includes grants for Members States and stakeholders to measure food waste and implement reduction measures.

At EU level, greater collaboration between DG ENV, DG AGRI, and DG SANTE is urged, as all three are involved in some manner in FLW prevention and reduction initiatives. Also at national level, in almost all EU countries, there should be cooperation between ministries to overcome the conflicting strategies and regulations. A collaborative action could thus be more effective.

Incentive procedures, such as tax relief on profits or added value, may be reviewed for those entities that work in a network in one or more supply chains. In this way, the promotion of stable organizations like Food Districts or Supply Chain contracts that include in their mission the objective of minimizing the production of surpluses is enhanced.

[3] https://www.iso.org/committee/8619920.html.

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5. Conclusions

The Sustainable Development Goals (12.3) and the EU policy agenda under the Circular Economy Action Plan and the Green Deal within the Farm to Fork Strategy recognize food waste as a worldwide issue that has to be addressed. Aditionally, the European Commission has recently proposed specific food waste reduction targets as part of the revision of the Waste Framework Directive further highlighting its desire to contribute to the achievement of international targets. By adopting legally binding reduction targets and facilitating their attainment through the establishment of baseline measurement and consistent monitoring, the EU has pledged to cut food waste at the retail and consumer levels in half in accordance with SDG 12.3.

Within this framework the LOWINFOOD project co-designed, together with actors of the food chain, low-waste value chains by supporting the demonstration of a portfolio of innovations in a set of value chains. The innovations were selected among promising solutions that had already been developed before the start of the project, with the aim to provide the necessary demonstration and upscale to allow market replication. The results concern both the level of innovation for each individual innovation and the overall result in terms of scenarios[4]. In this process innovators and researchers were able to identify the main barriers to the implementation of the innovations and thus, with the multiple-step methodology proposed in this deliverable, a toolbox containing a set of strategies to support the diffusion of innovations against FLW was developed.

The six identified strategies address a barrier-related need, are pertinent to a particular value chain phase, and are suitable for a specific governance territorial level. Additionally, the degrees of effectiveness and feasibility are made evident. The proposed strategies are not innovative in themselves, but they are set on the base of the results of the demonstrations of the LOWINFOOD innovations and on the systematic confrontation with the actors involved in their implementation, thus they can be very concrete and useful for policy makers and stakeholders. In addition, the evaluation of the potential impact in relation to the feasibility facilitates the comparability of the different options, effectively providing a prioritization.

[4] Evidence of these results can be consult in deliverable D1.6 – FLW evaluation of innovations, D1.7 – Socio-economic evaluation of innovations, D1.8 – Environmental evaluation of innovations and D1.9 – Scenarios of food waste reduction through innovation.

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Appendix 1 – Delphi questionnaire

Strategy	Statement	Topic 1 potential impact	Topic 2 level of feasibility	Topic 3 territorial scale
S1 *Strengthen trade associations and producer organizations*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "*lack of network among stakeholders*" within the value chains. One possible strategy to overcome this barrier could be to **strengthen trade associations and producer organizations**, so that members can easily share knowledge and establish efficient production standards.	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local
S2 *Supporting new networks of cooperation among innovators*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "*lack of network among stakeholders*". One possible strategy to overcome this barrier could be to **support new networks of cooperation among innovators,** so that they can easily share information and data.	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local

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Strategy	Statement	Topic 1 potential impact	Topic 2 level of feasibility	Topic 3 territorial scale
S3 *Incentives for companies that reduce FLW*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "lack of motivation of entrepreneurs". One possible strategy to overcome this barrier could be to provide **incentives for companies that reduce FLW** (f.i. waste tax reduction).	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local
S4 *Regulations that force companies to reduce FLW*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "lack of motivation of entrepreneurs". One possible strategy to overcome this barrier could be to introduce **regulations that force companies to reduce FLW** (f.i. penalty fee).	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local

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Strategy	Statement	Topic 1 potential impact	Topic 2 level of feasibility	Topic 3 territorial scale
S5 *Public awareness raising and information campaigns*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "lack of motivation of citizens". One possible strategy to overcome this barrier could be to carry out **public awareness raising and information campaigns** targeted to citizens (f.i. pilot programs in school canteens).	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local
S6 *Regulations to record data about FLW*	During the focus groups with the LOWINFOOD innovators one barrier to the implementation of the innovations has been identified in the "lack of data in order to use the technology behind the innovations". One possible strategy to overcome this barrier could be to introduce **regulations that force food companies to record data about FLW**. In this way, for instance, all the support decision-making applications would be accurate and reliable.	According to your experience, which is the **potential impact** (in a 0-10 scale, where 0=no impact and 10=maximum impact) of implementing this strategy? In other words, which is the effectiveness in overcoming the barrier and thus in reducing FLW?	According to your experience, which is the **level of feasibility** (in a 0-10 scale, where 0=no feasible at all and 10=very feasible) of this strategy? In other words, how doable is to implement this strategy at the policy/market level?	According to your experience, which could be a **suitable governance territorial scale** to implement this strategy? ○ EU ○ national ○ regional/local

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