

LOWINFOOD

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

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D6.6 Practice Abstracts third batch

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LOWINFOOD Consortium

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4	FH Munster University of Applied Sciences	ISUN	Germany
5	The James Hutton Institute	JHI	United Kingdom
6	Universitaet Fuer Bodenkultur Wien	BOKU	Austria
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11	Matomatic AB	MATO	Sweden
12	Unverschwendet GmbH	UNV	Austria
13	Akademie Deutsches Baeckerhandwerk nord 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	Assemblée des Régions Européennes Fruitières Légumières et Horticoles	ARE	France
26	L.V.L Anonymi Emporiki Toyristiki Kksenodoxeiaki Kataskevastiki Etaireia	BLU	Greece
27	Iridanos-Inabelos Anonymi Etaireiatouristikis Ksenodoxeiai Kai Agrotikes Epixeiriseis	THA	Greece
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Summary

This deliverable contains the resume and contents of the third batch of practice abstracts, containing 10 abstracts. The abstracts are aimed at describing the innovative knowledge produced during the implementation of the LOWINFOOD project, and they specifically refer to the LOWINFOOD innovations for food loss and waste prevention, which are being demonstrated as part of project's activities. The first 5 practice abstracts were compiled in D6.4 and submitted in April 2022. Another 10 practice abstracts were delivered in D6.5 and submitted in October 2022. For a total of 25 practice abstracts by the end of the project in February 2025, the present report contains the remaining 10 abstracts. The format of the LOWINFOOD Practice Abstracts follows the guidance and templates available on the EIP-AGRI website.

A practice abstract is a short summary describing the main information / recommendations / practices that can serve to the end-users in their daily practice. The end-user material produced contains a substantial number of summaries for practitioners in the [EU CAP Network website](#) common format ("Practice Abstracts"), including the characteristics of the project (e.g. contact details of partners, etc.).

The full package of 25 LOWINFOOD practice abstracts contains all the outcomes/recommendations which were collected and elaborated during the testing of the innovations related to food loss and waste reduction.



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 food loss and waste (fruits & vegetables, bakery products and fish), as well as in at-home and out-of-home consumption. 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 28 entities, located in 13 different European countries, and ranging from universities and research institutes to start-ups, foundations, associations, and companies working in the food sector.

The present deliverable containing the third set of Practice Abstracts (PA) is part of the WP6 “Communication, dissemination and market replication” of LOWINFOOD, aimed at spreading the project’s results and outcomes. After discussing the topic in the Executive Board Meeting, the content for the third batch of PAs was agreed among Executive Board members:

- PA N° 16: Platform to donate fruit & vegetable withdrawn from the market
- PA N° 17: Stakeholder dialogues for reducing bread waste in Finland
- PA N° 18: We needed to talk about fish
- PA N° 19: Save Food, Save Resources and Emissions
- PA N° 20: Socioeconomic impact evaluation
- PA N° 21: Innovations for Food Waste Reduction
- PA N° 22: How Involvement in Innovations Changes Food Waste Attitudes and Behaviours
- PA N° 23: Are all Pupils Equal as Food Waste Makers?
- PA N° 24: The participation and satisfaction of women and men
- PA N° 25: Policy and market recommendations

Although most of the selected innovations have been included into previous practice abstracts deliverables, the present report contains additional valuable innovations and findings: The software for managing fruit and vegetable withdrawals and donations to charities, the stakeholder dialogue in the Finnish bakery sector and the stakeholder dialogue in the German fish supply chain. These are part of the third batch, together with some other useful information and lessons learned during the project, which complete the full set of 25 Practice Abstracts of the LOWINFOOD project.

These are the innovations that have been compiled in the previous practice abstracts batches: PAs from n.1 to n.5 correspond to the first batch produced as part of deliverable D6.4, in April 2022; PAs from n.6 to n.15 refer to the 10 abstracts produced as part of deliverable D6.5, in October 2022.



- PA N° 1: Stakeholder dialogues for bakeries in Italy
- PA N° 2: FoodTracks – Better decisions for bakeries
- PA N° 3: KITRO – Reduce food waste, save money by AI
- PA N° 4: CozZo: Reducing food waste in households using a mobile application
- PA N° 5: REGUSTO and monitoring of waste on the restaurant-home route
- PA N° 6: Marketable products from surplus fruit and vegetables
- PA N° 7: Bringing raw materials to the right place with LEROMA
- PA N° 8: Reduce retail food waste with forecasting
- PA N° 9: Innovating supplier-retailer agreements to avoid waste of bakery products
- PA N° 10: Fish supply chain dialogue to reduce waste in Scotland
- PA N° 11: Predicting Food Demand with Mitakus
- PA N° 12: Nudge pupils to reduce food waste
- PA N° 13: Innovative education reducing food waste in Austrian schools
- PA N° 14: Research in a multi-actor approach
- PA N° 15: Efficacy of innovations against food waste

In order to make this information exchange smoother among actors, the EIP-AGRI has established a common format for submitting the practice abstracts, which facilitates knowledge flows on innovative and practice-oriented projects from the start till the end of the project. The use of this format also enables farmers, advisers, researchers and all other actors across the EU to contact each other. Furthermore, this common format includes a guidance which defines the length that the description text should have, as well as the option to add the text in the native language(s) that has(ve) been used when carrying out the activity that is described.

LOWINFOOD has designed a specific template following the common format and guidance established by the EIP-AGRI, to make the practice abstracts more eye-catching (see below), and has created a [dedicated section](#) on the project's website to publish them.





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PRACTICE ABSTRACT No: 16

The S.I.R. platform to donate fruit & vegetables withdrawn from the market

During peak production periods for fruit and vegetables, market prices may fall to levels that are unprofitable for farmers to even harvest the crops. To avoid this, the EU has implemented a system to withdraw these products from the market. The EU compensates the farms through the producer organizations (POs) for the quantities of fresh fruit and vegetables withdrawn from the market and distributed for free for human consumption (the most desirable destination) or "other destinations" such as animal feed, compost facilities, biodigestion plants, etc.

The S.I.R. platform (Sistema Informativo Ritiri in Italian; Withdrawal Information System in English) is an online IT tool created by the Emilia-Romagna Region of Italy for the management of "Withdrawals of fruit and vegetables from the Market" (Reg (EU) 1308/2013) and to facilitate contacts and collaboration between POs which donate these fruit and vegetables to charitable organizations and institutions which receive them for free (as provided of EU Reg 2017/891).

The platform has numerous advantages compared to paper-based management such as, complete dematerialization of all documents, a higher transparency in all phases of the process, and enhancement of charitable distribution of the products (or other secondary uses) compared to the destruction of the product, as it makes the product available in the shortest possible time to all the charities/beneficiaries potentially eligible to receive the product.

Through the LOWINFOOD project, an attempt was made to "export" the S.I.R. platform to Romania, where a demonstration was conducted. A complete simulation of the S.I.R. adoption in Romania has been created, except for the (real) refunding of farmers. The stakeholders, farmers and charity with the support of the University Centre of Pitesti (University POLITEHNICA of Bucharest) as a mediator, monitored their monthly food donation in 2023-2024, to test the platform in their context.

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PRACTICE ABSTRACT No: 16

Additional information

In 2022, nearly 60 million tons of fruit and vegetables were harvested in the European Union, with a value of around 70 billion euros. Of this, between 1.5% and 2% was withdrawn from the market to be donated to charities, or used for animal feed, composting or biogas production.

All Practice Abstracts prepared by LOWINFOOD can be found [here!](#)



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ABOUT LOWINFOOD

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PRACTICE ABSTRACT No: 16

La piattaforma S.I.R. per donare frutta e verdura ritirata dal mercato

Nei periodi di picco della produzione di frutta e verdura, i prezzi di mercato possono scendere al di sotto di livelli che rendono non redditizio per gli agricoltori raccogliere i raccolti. Per evitare ciò, l'UE ha implementato un sistema per ritirare questi prodotti dal mercato. L'UE compensa le aziende agricole attraverso le OP per le quantità di frutta e verdura fresca ritirate dal mercato e destinate gratuitamente al consumo umano (la destinazione più desiderabile) o ad "altre destinazioni" (mangimi per animali, compostaggio, biodigestore, ecc.).

La piattaforma S.I.R. è uno strumento informatico online creato dalla Regione Emilia-Romagna per la gestione dei "Ritiri di frutta e verdura dal mercato" (Reg (UE) 1308/2013) e per facilitare i contatti e la collaborazione tra le organizzazioni di produttori (OP) che devono donare questa frutta e verdura e le organizzazioni e istituzioni caritatevoli che la ricevono gratuitamente (come previsto dal Reg UE 2017/891).

La piattaforma presenta numerosi vantaggi rispetto alla gestione cartacea, come la completa dematerializzazione di tutti i documenti, una maggiore trasparenza in tutte le fasi del processo, un miglioramento della distribuzione benefica dei prodotti (o altri usi secondari) rispetto alla distruzione del prodotto, poiché rende il prodotto disponibile nel più breve tempo possibile a tutte le organizzazioni benefiche/beneficiari potenzialmente idonei a ricevere il prodotto.

Grazie al progetto LOWINFOOD, si è tentato di "esportare" la piattaforma S.I.R. in Romania, dove è stata condotta una dimostrazione. È stata creata una simulazione completa dell'adozione di S.I.R. in Romania, ad eccezione del rimborso (reale) degli agricoltori. Gli stakeholder, agricoltori e organizzazione benefica con il supporto del Centro Universitario di Pitesti (University POLITEHNICA of Bucharest) come mediatore, hanno monitorato la loro donazione alimentare mensile nel 2023-2024, per testare la piattaforma nel loro contesto.

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PRACTICE ABSTRACT No: 17

Stakeholder dialogue to innovate a roadmap for reducing bread waste in Finland

Bread is one of the most wasted food categories in Finland. To innovate new ways for reducing bread waste in the bread value chain, relevant stakeholders were invited to join a stakeholder dialogue. Bakeries, retailers, and the Finnish Bakery Federation participated either in a series of online workshops or interviews where current challenges were identified and current and possible future actions to prevent bread waste and surplus were discussed. As a result of this stakeholder dialogue, a joint roadmap for reducing bread waste was developed.

The roadmap for bread waste reduction in Finland includes 15 action points in total, divided between actions directed mostly at bakeries, retailers, and other stakeholders.

The suggested actions for bakeries highlight the importance of bread loss and waste analytics to direct strategic and operational activities, developing a zero-waste culture, sharing knowledge, integrating bread waste reduction into product development, reducing assortment, and communicating about bread waste to consumers. The actions for retailers focus on placing orders earlier and developing forecasting methods, mutual sharing of information with bakeries, and managing assortment and empty shelves. The actions for other stakeholders include, among others, developing new solutions to address bread surplus redistribution and re-use, developing advanced bread packaging, and easing of legislation related to food labelling for products that re-use materials.

This stakeholder dialogue was organized as part of the Work Package (WP) 3 in the LOWINFOOD project, and it aims to analyse innovations against loss of bakery products. Besides Finland, the same activities have been conducted in Italy and Sweden.

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Additional information

Bakery sector in Finland

In Finland, the bakery sector consists of two large industrial bakeries and several hundred smaller bakeries. The two largest bakeries account for over 50% of the market share. Fresh bread is sold pre-packaged mainly at retailers' stores. Sales of fresh (soft) bread account for over 90% of bakeries' turnover.

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PRACTICE ABSTRACT No: 17

Tiekartta leipähävikin vähentämiseksi Suomessa

Leivän arvoketjun aikana merkittävä osa hävikistä ja jätteestä syntyy tuottajan, eli leipomon ja vähittäiskaupan rajapinnassa, ja Suomessa tuore leipä onkin suurimpia hävikkiin päätyviä tuotekategorioita. LOWINFOOD-hankkeen osana suomalaisia leipomoja, vähittäiskauppojen edustajia sekä Suomen Leipuriliitto ry kutsuttiin mukaan kehittämään yhteistä tiekarttaa leipähävikin vähentämiseksi. Tiekartta muodostettiin verkkotyöpajojen sekä haastatteluiden perusteella. Työpajoissa ja haastatteluissa keskusteltiin vallitsevista ongelmista leipähävikin näkökulmasta, nykyisin käytössä olevista hävikin vähentämisen ratkaisuksista sekä innovoitiin uusia hävikin vähentämisen tapoja. Vastaava tiekartta kehitettiin hankkeessa myös Ruotsiin ja Italiaan.

Lopputuloksena kehitetty tiekartta esittelee yhteensä 15 erilaista toimenpidettä jaoteltuina leipomoiden, vähittäiskaupan, ja muiden sidosryhmien vastuulla oleviin toimenpiteisiin.

Tiekartan toimet leipomoille liittyvät siihen, miten mittaamisella ja analytiikalla voidaan kehittää strategisia ja operationaalisia hävikin vähentämisen toimia, hävikittömän kulttuurin luomiseen, hiljaisen tiedon jakamiseen, hävikin ehkäisyyn integroimiseen tuotekehitykseen, tuotevalikoiman kehittämiseen sekä kuluttajaviestintään.

Vähittäiskauppojen toimet keskittyvät tilaamisen ja kysynnän ennustamisen kehittämiseen, molemminpuolisen tiedonjaon kehittämiseen sekä valikoimanhallintaan (ml. tyhjien hyllyjen hallinta).

Muiden toimijoiden toimet sisältävät muun muassa ylijäämän hyödyntämisen tehostamisen, hävikkiä vähentävien leipäpakkausten kehittämisen sekä pakkausmerkintöihin liittyvän lainsäädännön höllentämisen.

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PRACTICE ABSTRACT No: 18

We needed to talk about fish

A significant proportion of the fish that ends up in nets does not find its way onto our plates. In scientific literature, estimates about the share/extent of the proportion varies a lot. According to some estimates every second fish caught is not ultimately consumed by humans. There are no current and exact figures on what proportion of fish is lost in the German market for human consumption.

In the LOWINFOOD project, we aimed to talk to stakeholders, and bring these people, companies and organizations into conversation with each other - from fishing to processing and refinement, wholesale and logistics to retail and catering; participants from science as well as civil society and government institutions also took part. The goal was to better understand where the losses are particularly high and which strategies and measures could lead to an improvement in the situation.

The stakeholder dialogue was conducted as two formats: 1. Interviews in which experts presented their views on problems and possible solutions in the field of fish in detail. 2. Workshops in which the interviewees and other experts were able to discuss with each other. The participants of the stakeholder workshop emphasise that relatively small amounts of waste are generated in the steps of the value chain that is important for Germany (especially processing, transport, wholesale and retail trade and catering). This is mainly justified by increased fish prices, meaning no company has an interest in unnecessary losses. If losses do occur, this is often due to the lack of (skilled) workers. This shortage should be combated through more attractive working conditions and policy measures. In the upstream and downstream stages of the value chain (upstream: fishing, mostly by foreign fleets and often in developing countries; downstream: consumption in private households) large amounts of waste are generated. It is up to companies and politics to influence these stages, for example through better coordination with fisheries in the Global South and support for the introduction of sustainability labels such as Marine Stewardship Council (MSC); and also, through better nutritional education that enables people to use the valuable resource of fish appropriately and as completely as possible.

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LOWINFOOD

PRACTICE ABSTRACT No: 18

Additional information

Seafood products are highly valuable yet perishable. Therefore, efficient value chain coordination is key to ensuring that they are allocated to the most profitable potential uses. Coordination becomes even more critical when adding value to surplus products like by-catch, or by-products from processing. While innovators around the world are exploring alternative uses such as extraction of high-value nutrients from by-products, and some countries have achieved higher percent use of their catch, the scope for creating additional value is still significant.

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PRACTICE ABSTRACT No: 18

Gesprächsthema Fisch

Ein erheblicher Teil des Fisches, der in den Netzen landet, findet nicht den Weg auf unsere Teller. Angaben, wie hoch dieser Anteil einzuschätzen ist, gehen in der wissenschaftlichen Literatur deutlich auseinander. Einige Schätzungen gehen davon aus, dass jeder zweite gefangene Fisch am Ende nicht von Menschen verzehrt wird. Aktuelle und exakte Zahlen, welcher Anteil des Fisches im deutschen Markt für den menschlichen Verzehr verloren geht, gibt es nicht.

Im LOWINFOOD-Projekt wollten wir mit Stakeholdern, also Anspruchsgruppen oder Interessengruppen, ins Gespräch kommen und diese Personen, Unternehmen und Organisationen miteinander ins Gespräch bringen – von der Fischerei über die Verarbeitung und Veredelung, Großhandel und Logistik bis zu Einzelhandel und Gastronomie; dazu kamen Teilnehmende aus der Wissenschaft sowie zivilgesellschaftlichen und staatlichen Institutionen. Ziel war, besser zu verstehen, an welchen Stellen besonders viele Verluste entstehen, und welche Strategien und Maßnahmen zu einer Verbesserung der Lage führen könnten.

Der Stakeholderdialog stützte sich vor allem auf zwei Formate: 1. Interviews, in denen Expertinnen und Experten ausführlich ihre Sicht auf Probleme und Lösungsmöglichkeiten im Themenfeld Fisch darstellen konnten. 2. Workshops, in denen die interviewten Personen sowie weitere Expertinnen und Experten miteinander diskutieren konnten. Die Teilnehmenden am Stakeholderworkshop betonten, dass in dem Bereich der Wertschöpfungskette, der für Deutschland besonders wichtig ist (vor allem Verarbeitung, Transport, Groß- und Einzelhandel und Gastronomie) relativ geringe Abfallmengen anfallen. Dies wird vor allem damit begründet, dass Fisch sehr teuer geworden ist und daher kein Unternehmen ein Interesse an unnötigen Verlusten hat. Wenn es doch zu Verlusten kommt, hat das oft mit dem Fach- und Arbeitskräftemangel zu tun, der durch attraktivere Arbeitsbedingungen und politische Maßnahmen bekämpft werden sollte. In den vor- und nachgelagerten Stufen der Wertschöpfungskette (vorgelagert: Fischerei, meist von ausländischen Flotten und oft in Entwicklungsländern; nachgelagert: Konsum in den Privathaushalten) hingegen fallen großen Abfallmengen an. Hier gilt es für Unternehmen und Politik, Einfluss auf diese Stufen zu nehmen, beispielsweise durch eine bessere Koordination mit der Fischerei im Globalen Süden und der Unterstützung bei der Einführung von Nachhaltigkeitssiegeln wie Marine Stewardship Council (MSC); zudem durch eine bessere Ernährungsbildung, die Menschen dazu befähigt, die wertvolle Ressource Fisch angemessen und möglichst vollständig zu verwerten.

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PRACTICE ABSTRACT No: 19

Save Food, Save Resources and Emissions

Food waste has a big impact on the environment, mainly because of the emissions from producing food. If we can prevent food waste or redistribute surplus food, the whole food supply chain becomes more efficient. This leads to big savings in emissions and environmental costs. The environmental benefits of these actions are much greater than the effort it takes to implement them.

Producing food uses a lot of resources like fuel, land, water and raw materials, which harms the environment and costs a lot. For example, farming cattle releases methane, and using fertilizers releases nitrous oxides, both of which contribute to climate change. Emissions from transporting, storing, and cooking food also add to the problem. If we wasted less food, we could cut down on these harmful emissions.

The best way to help the environment is to prevent food waste in the first place. This is especially true for animal-based products, which have a big impact on climate change, or e.g. citrus products or almonds, which use a lot of water during production. If we can't prevent surplus food or food waste, the next best thing is to redistribute or donate food so people or animals can consume it, or it can be utilised for industrial purposes. Recycling as composting or biodigestion comes after that. The last resort should always be sending food to the landfill, what is not allowed in Europe by law!

Measures to reduce food waste are, for example, the use of software to improve forecasting or turning surplus food into products such as breadcrumbs or vegetable chutneys. Those efforts, such as the energy used for the computer to run the software or to cook the chutney, have a small environmental impact. The environmental benefits from preventing food waste are much bigger. Therefore, these actions can save resources and cut emissions.

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

LOWINFOOD

PRACTICE ABSTRACT No: 19

Additional information

The benefits of preventing food waste are measured by the impacts saved per kilogram of food. The further back in the supply chain food waste is avoided, the more emissions and resources can be saved as additional environmental impacts from transport, storage and processing can be avoided. However, the type of food that is saved from waste has an even greater impact on the environmental impact. The more animal products can be saved from going to waste, the more emissions and resources can be saved, as the production of meat and dairy products, which cause more emissions than plant products, can be reduced.

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ABOUT LOWINFOOD

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



PRACTICE ABSTRACT No: 19

Lebensmittel reduzieren, Ressourcen und Emissionen einsparen

Lebensmittelverschwendung hat große Auswirkungen auf die Umwelt, hauptsächlich wegen der Emissionen, die bei der Produktion von Lebensmitteln entstehen. Wenn wir Lebensmittelverschwendung verhindern oder überschüssige Lebensmittel umverteilen können, wird die gesamte Lebensmittelversorgungskette effizienter. Dies führt zu erheblichen Einsparungen bei Emissionen und Umweltkosten. Die ökologischen Vorteile dieser Maßnahmen sind viel größer als der Aufwand bei der Umsetzung.

Die Produktion von Lebensmitteln verbraucht viele Ressourcen wie Treibstoff, Land, Wasser und Rohstoffe, was die Umwelt schädigt und hohe Umweltkosten verursacht. Zum Beispiel setzt die Rinderzucht Methan frei, und der Einsatz von Düngemitteln setzt Stickoxide frei, die beide zum Klimawandel beitragen. Emissionen aus dem Transport, der Lagerung und dem Kochen von Lebensmitteln verschärfen das Problem zusätzlich. Wenn wir weniger Lebensmittel verschwenden würden, könnten wir diese schädlichen Emissionen reduzieren.

Der beste Weg, der Umwelt zu helfen, ist, Lebensmittelverschwendung von vornherein zu verhindern. Dies gilt besonders für tierische Produkte, die einen großen Einfluss auf den Klimawandel haben, sowie z.B. für Zitrusfrüchte oder Mandeln, die bei der Produktion viel Wasser verbrauchen. Wenn wir Lebensmittelverschwendung nicht verhindern können, ist die nächstbeste Option, Überschüsse umzuverteilen oder zu spenden, damit Menschen oder Tiere sie konsumieren können. Kompostierung oder Biogasproduktion kommt erst danach. Die letzte Option sollte immer sein, Lebensmittel auf der Deponie zu entsorgen, was in Europa eigentlich nicht mehr zulässig ist!

Maßnahmen sind zum Beispiel eine bessere Prognose mit Hilfe einer Software oder die Umwandlung von überschüssigen Lebensmitteln in Produkte wie Semmelbrösel oder Chutneys. Der Aufwand, die für den Betrieb der Software oder das Kochen des Chutneys benötigt wird, hat nur geringe Auswirkungen auf die Umwelt. Die ökologischen Vorteile der Vermeidung von Lebensmittelverschwendung überwiegen.

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



PRACTICE ABSTRACT No: 20

Socioeconomic impact evaluation of LOWINFOOD innovations

The aim of socio-economic impact evaluation in LOWINFOOD is to assess the value created by individual innovations against food loss and waste, and by the overall project for different stakeholder groups. Among the stakeholders, we consider the organisations demonstrating the innovations, the individuals taking part in the demonstrations, non-research partners of the LOWINFOOD consortium, and the wider society. The socio-economic impact assessment framework was developed as a resource for future innovation action projects as prospective users and applied for conducting the evaluation in the LOWINFOOD project.

The purpose and design of food waste prevention and reduction innovations matters when considering and comparing their socio-economic outcomes. The generic economic indicators included in the framework can be captured best for technological innovations with immediate affects. The innovations were found to improve the food waste related awareness and intentions of those taking part in their demonstration. Most non-research partners of the consortium stated that they had a positive experience from their participation in the LOWINFOOD consortium, and referred to aspects such as network creation, business expansion, and resulting knowledge exchange. The assessment concluded that jobs were created, not through the demonstration of the innovations but through the LOWINFOOD funding provided to innovative start-up partners.

For future analysis, we recommend improving data sharing agreements with business partners to ensure better disclosure, and automatising the data collection procedure, as much as possible, to reduce its burden for test locations and improve the quality of the data used in assessment.

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LOWINFOOD

PRACTICE ABSTRACT No: 20

Additional information

While the innovation literature is extensive, the resources for evaluating the socio-economic outcome of individual food waste prevention and reduction innovations are few and limited. Additionally, the impact of European research funding to its non-research organisation recipients has not been systematically explored so far. The LOWINFOOD socio-economic impact assessment framework represents a replicable and systematic method for future projects. Such comprehensive assessment enables accounting for innovation performance and wider outcomes of public funding, both of which are unaccounted for within current impact evaluation practice.

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

LOWINFOOD

PRACTICE ABSTRACT No: 21

Efficacy of Innovations to reduce Food Waste

The LOWINFOOD project tested 14 innovations to tackle food waste in various contexts, aiming to advance them to high Technology Readiness Levels (TRL). Eight innovations showed measurable or partial success in reducing food loss and waste, as the baseline situation is compared with the period during which the innovation is implemented. The result of the assessment highlights practical opportunities for the improvement of the innovation and the way it is implemented by practitioners.

Successful examples include the use of AI-based smart bins in Germany, Greece, and Switzerland, which helped canteens track and reduce plate waste, and AI-based forecasting software for bakeries in Germany, which minimised surplus by improving production planning. A mobile app in Italy enabled restaurants to sell leftover meals directly to consumers, reducing post-consumer waste while offering affordable food supply. Similarly, a cooperation system in Austria effectively redistributed fruit and vegetable by-products, preventing losses and adding value to supply chains. An innovation developed in Italy and tested in Romania showed the potential to recover surplus food in agriculture, supporting the implementation of a Common Agriculture Policy (CAP) measure providing economic aid to producers facing losses.

Some challenges emerged, including limited access to production data and organisational reluctance to share information, which hindered the ability to measure the impact of certain innovations. Additionally, some tools relied heavily on user engagement, which affected their overall performance and effectiveness during testing.

Practitioners can benefit from these innovations by reducing operational costs, improving resource management, and contributing to sustainability goals.

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

LOWINFOOD

PRACTICE ABSTRACT No: 21

Additional information

A detailed report on the results of the 15 demonstrations will be published on the LOWINFOOD website in 2025, titled:

“D 1.6: Evaluation of the Efficacy of the Innovations.”

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



PRACTICE ABSTRACT No: 21

Efficacia delle innovazioni per la riduzione dello spreco alimentare

Il progetto LOWINFOOD ha testato 14 innovazioni per affrontare lo spreco alimentare in diversi contesti, con l'obiettivo di portarle a un alto livello di maturità tecnologica. Otto innovazioni hanno dimostrato successo nella riduzione delle perdite e degli sprechi alimentari (FLW), confrontando la situazione di partenza con il periodo di implementazione dell'innovazione. I risultati della valutazione evidenziano opportunità pratiche per migliorare sia le innovazioni che le modalità con cui vengono adottate dai professionisti del settore.

Esempi di successo includono l'uso di cestini intelligenti basati su AI in Germania, Grecia e Svizzera, che hanno aiutato le mense a monitorare e ridurre gli sprechi nei piatti, e un software di previsione basato su AI per panifici in Germania, che ha ridotto le eccedenze grazie a una migliore pianificazione della produzione. Un'app mobile in Italia ha permesso ai ristoranti di vendere direttamente ai consumatori i pasti avanzati, riducendo lo spreco post-consumo e offrendo opzioni alimentari a prezzi accessibili. Allo stesso modo, un sistema di cooperazione in Austria ha redistribuito efficacemente frutta e verdura rimaste in campo, prevenendo perdite e aggiungendo valore alle filiere. Un'innovazione sviluppata in Italia e testata in Romania ha mostrato il potenziale per recuperare eccedenze alimentari in agricoltura, supportando l'implementazione di una misura della PAC che fornisce aiuti economici ai produttori che subiscono perdite.

Durante la misurazione sono emerse alcune sfide, tra cui l'accesso limitato ai dati di produzione e la riluttanza a condividere dati.

Alcune di queste innovazioni possono offrire vantaggi concreti ai professionisti del settore, contribuendo a ridurre i costi operativi, a migliorare la gestione delle risorse e a raggiungere obiettivi di sostenibilità.

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

LOWINFOOD

PRACTICE ABSTRACT No: 22

How Involvement in Innovations Changes Food Waste Attitudes and Behaviours

Reducing consumers' food waste requires increased awareness, and better attitudes and behaviour. We know that active involvement in food management tasks is more effective in triggering change compared to passive interventions like information campaigns. Thus, as part of the LOWINFOOD socio-economic evaluation, we assessed if the employees, household members, and high-school students involved in demonstrating our innovations experienced a positive change in their awareness, attitude, intention, and behaviour towards food.

To this end, we collected survey responses before and after the demonstration of 12 innovations of different types: food waste prevention governance, consumer behavioural change, supply chain efficiency, and food redistribution. We asked about how much our participants agreed with a series of statements. Our study was run in nine EU countries, for a total of more than 500 responses across the two phases!

Involvement in the LOWINFOOD innovations against food waste increased participants' moral concern for this societal challenge and their intention to act for addressing it beyond the demonstration context. It also reinforced the relationship between their intention and the actual behaviour. The impact was stronger on women and on people with higher education, while influencing young people, including high-school students, proved more challenging.

Among employees, positive change was driven by innovations dealing with supply chain efficiency (Kitro, FoodTracks, Mitakus) and with food waste prevention governance (our supply chain dialogue), while food redistribution actions seemed less effective. Household members also experienced significant positive change thanks to their involvement in the demonstration of a food management app (CozZo). Interestingly, none of our indicators across all innovation types registered experience of a negative change.

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Additional information

Active involvement in interventions is very effective in changing people's attitudes and behaviours when happening in workplaces. Unfortunately, asking directly about food waste quantities and behaviours leads to unreliable results. In LOWINFOOD, we developed an evaluation strategy based on the Theory of Planned Behaviour, a widely adopted framework in environmental psychology that allows to explain individual behaviour in specific contexts and its determinants. We overcame the questionnaire bias by focusing on change between before and after involvement in our innovations, rather than absolute values.

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

LOWINFOOD

PRACTICE ABSTRACT No: 23

Are all Pupils Equal as Food Waste Makers?

Reducing food waste is widely recognised as a crucial step towards building a more sustainable food system. In order to reduce waste, numerous interventions, such as information campaigns, have been implemented. They often adopt a one-size-fits-all approach, assuming uniformity in the problem faced by all consumers.

This study aims to investigate the distribution of food waste generation among pupils in schools, recognising that not all students contribute equally to the issue. Utilising the Matomatic plate waste tracker, data was collected from 16 primary schools across Sweden, totaling 421,015 instances of plate wastage registrations.

The findings of the study reveal that 40% of the pupils in the studied primary school canteens did not waste any food at all. Among those who did waste food, the distribution was highly skewed, with a minority of wasting students (20%) accounting for a majority (60%) of the generated plate waste. Halving the waste generated by the group of high wasters would reduce overall plate waste by 31%. While there was slight variation between schools, all kitchens reported similar patterns, with the top 20% of plate waste events contributing significantly to overall waste.

These results underscore that plate waste generation is not a uniform problem among all pupils. Thus, interventions that target all students equally may not be effective, as the majority of the target group have limited potential to reduce waste. Instead, a more promising approach would involve identifying high-waste individuals and designing interventions tailored to this specific group. However, reaching these individuals, who may be resistant to general messages of food waste reduction, poses a significant challenge.

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RETASTE: Rethink Food Resources, Losses, and Waste Conference

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



PRACTICE ABSTRACT No: 23

Är alla elever lika bra på att skapa matavfall?

Att minska matsvinnet är viktigt för att bygga ett mer hållbart livsmedelssystem. För att minska svinnet har många insatser, såsom informationskampanjer, genomförts. Dessa är ofta lika för alla och antar att alla konsumenter står inför samma problem.

Denna studie syftar till att undersöka hur matsvinn är fördelat bland elever i grundskolor. Med hjälp av tallrikssvinnsvågar från Matomatic AB samlades data in från 16 grundskolor runt om i Sverige, vilket omfattade totalt 421 015 registreringar av tallrikssvinn.

Studien visade att 40 % av eleverna i de undersökta skolmatsalarna inte slängde någon mat alls. Bland de elever som slängde mat var fördelningen mycket sned, med en minoritet (20 %) som stod för en majoritet (60 %) av tallrikssvinnet. Att halvera svinnet från denna högsvinande grupp skulle minska det totala tallrikssvinnet med 31 %. Även om det fanns viss variation mellan skolor uppvisade alla skolmatsalar liknande mönster, där de 20 % som genererade mest svinn bidrog avsevärt till det totala svinnet.

Resultaten betonar att tallrikssvinn inte är ett likformigt problem bland alla elever. Därför kan insatser som riktar sig lika till alla elever på samma sätt vara ineffektiva, eftersom majoriteten av målgruppen har begränsad potential att minska sitt svinn. En mer lovande strategi skulle istället vara att identifiera individer med högt svinn och utforma insatser som är anpassade för denna specifika grupp. Dock innebär detta en betydande utmaning, eftersom dessa individer kan vara motvilliga att ta till sig generella budskap om att minska matsvinnet.

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



PRACTICE ABSTRACT No: 24

The participation and satisfaction of women and men in food waste prevention

Data collection for the socio-economic evaluation of LOWINFOOD innovations was challenging. As a result, the representative sample was small in several cases and the gender analysis was carried out by 4 categories of innovations rather than for each innovation. Data were collected through participant surveys distributed to employees of the companies, students in the schools, and members of the households implementing the innovations.

532 people took part in the surveys and there were more women than men (337 women, 63.3% and 173 men, 32.5%). In general, all were satisfied with the implementation of the innovations. However, women in particular felt slightly more satisfied and confident after the demonstration of the innovations.

In the category of food waste prevention governance, considered as social innovations, there were more male participants, but women reported higher satisfaction with the innovation implementation.

In the consumer behaviour change category, employees (mainly teachers), the majority were women, and both sexes reported positive satisfaction. Among household members, participation was balanced between women and men, and in general both sexes were very satisfied with the implementation of the innovations. For students, with a high prevalence of female respondents, the satisfaction rate was positive.

In the supply chain efficiency category, which are mainly considered as technological innovations, the satisfaction of women participants increased while that of men decreased.

Finally, in the food redistribution actions category, considered as organisational innovations, the participation was balanced, and both women and men were satisfied with the implementation of the innovations.

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

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PRACTICE ABSTRACT No: 24

Additional information

Vertical segregation among employees

A total of 226 employees were involved in the implementation of the innovations, with a balanced participation of men and women, but slightly more women: 132 were women (58%) and 92 men (42%). There is a clear vertical segregation among the employees: men predominate in managerial and executive positions (60.4% men and 37.8% women) while women are much more numerous in staff and temporary positions (79.8% women and 27.9% men).

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

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PRACTICE ABSTRACT No: 25

Policy and market recommendations

Researchers and innovators of the LOWINFOOD project developed a toolbox addressed to policy makers, and more in general to stakeholders of food supply chains, containing 6 strategies to support the diffusion of innovations that prevent and reduce food loss and waste (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 6 identified strategies to reduce Food Loss and Waste (FLW) are the following:

To overcome the lack of network among stakeholders:

1. Strengthen trade associations and producer organizations (to be implemented at regional level). Within this kind of cooperation members can share knowledge and establish efficient production standards.
2. Support networks of cooperation among innovators (to be implemented at national level), so that they can share information and data.

To overcome the lack of motivation of entrepreneurs:

3. Provide incentives for companies that reduce FLW (e.g. waste tax reduction).
4. Introduce regulations that force companies to reduce FLW (e.g. penalty fee). (to be implemented at national level)

To overcome the lack of motivation of citizens:

5. Carry out public awareness raising and information campaigns targeted to citizens (e.g. pilot programs in school canteens). (to be implemented at EU, national and regional level)

To overcome the lack of data in order to use the technology behind the innovations:

6. Introduce regulations that force food companies to record data about FLW. (to be implemented at EU level)

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In a nutshell

LOWINFOOD identified 6 key strategies to support the diffusion of innovations against food loss and waste



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LOWINFOOD

PRACTICE ABSTRACT No: 25

Additional information

How did we end up with these strategies?

1. Focus group with LOWINFOOD innovators
2. Barriers and solutions for the diffusion of innovations are identified
3. Solutions are merged into wider strategies
4. Strategies are rated by a panel of experts (for impact and feasibility)
5. Strategies are prioritised

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LEROMA



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