RETASTE Conference Abstracts
RETASTE-PLW-1468-In-person Oral
Rethymno, September 16-18, 2026
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DOI:10.5281/zenodo.23678366

Innovations for Food Waste Prevention Across Supply Chains: A PRISMA-based Review of Research and EU Projects

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Abstract

The role of innovations in achieving targets of FW reduction is highly recognised (Aramyan et al., 2021), especially when they are integrated in policy and organisational frameworks (Carvalho et al., 2025). In this study, a PRISMA-based systematic review methodology is applied in the study, combining multiple information sources, including peer-reviewed scientific literature and European research and innovation projects. The objective of the review is to identify innovations against FW that have been empirically tested and for which evidence of efficacy in reducing FW is available. The scientific literature review starts from a batch of 3,012 scientific articles (keywords considered: innovation, intervention, valorisation, food waste and food loss and similar terms). Following title screening, articles unrelated to FW reduction or focused exclusively on waste treatment are excluded, leaving 939 publications (31%) for further assessment. The eligibility of these publications is evaluated along the following criteria: studies have to describe empirically tested innovations, provide a measure of efficacy, and focus on FW prevention, including prevention at source, redistribution, animal feeding and industrial uses. Eligible publications are inputted in Notebook LM to support systematic data extraction. In parallel, another systematic assessment is focused on EU-funded research projects funded under Horizon 2020 and Horizon Europe programmes. Using the keyword “food waste”, 378 projects are identified in the CORDIS database, and their objectives are screened to search keywords related to FW innovation or valorisation. For the 138 selected projects, all public deliverables are retrieved where available, resulting in 47 projects with accessible documentation. After excluding 5 projects that don’t report tested actions, 42 projects are retained for detailed analysis, and their deliverables are inputted in Notebook LM. Using Notebook LM, we build a list of 500+ innovations reporting description, innovation type, level of the FW hierarchy, supply chain stage, sector or product category, involvement of start-up, methods and outcomes to assess effectiveness. Findings show a strong predominance of technological innovations, representing 76% and 67% of the listed innovations from literature and projects, respectively. Innovations coming from literature review mostly address recycling (37%) and industrial uses (38%), while innovations tested during projects are more focused on prevention at source (43%). The results also underline the need to accompany the development of innovations with assessment of their efficacy (Goossens et al., 2019) to achieve the intended FW reduction targets.Overall, current research efforts remain concentrated on downstream valorisation options rather than on preventing food waste at source (Giordano et al., 2020). This database will be further used in the project to support the design of evidence-based FW reductions scenarios, which will serve to understand the possible contribution of actions against FW to achieving EU climate objectives.

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Keywords: Innovations, Food Waste Prevention, Systematic review, Notebook LM, Efficacy of innovations

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Acknowledgments: This work was supported by the Horizon Europe project WASTEWISE (Waste Avoidance Strategies for Environmental Sustainability), which is funded by the European Union's Horizon Europe research and innovation program under Grant Agreement no. 101181915. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

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