IEA Bioenergy
Technology Collaboration Programme

Advanced sorting & monitoring technologies for food waste

Examples in Sweden

IEA Bioenergy: Task 36

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Preface

This report highlights recent innovative advancements handling of food waste aiming at minimizing generation and improving sorting and quality of this waste stream for further processing. This work is part of two complementary series of publication by IEA Bioenergy Task 36. The first one on the role of advanced sorting technologies in accelerating the transition of the waste management sector toward a more circular economy. The second one emphasizes the importance of reducing food waste and improving the recovery of unavoidable food waste for bioenergy production.

IEA Bioenergy Task 36, working on the topic “Material and Energy Vaporization of Waste in a Circular Economy”, seeks to raise public awareness of sustainable energy generation from biomass residual and waste fractions including municipal solid waste (MSW), as well as to increase technical information dissemination. As outlined in the 3-yearwork programme, Task 36 seeks to understand the role energy from waste and material recycling can have in a circular economy and identify technical and non-technical barriers and opportunities needed to achieve this vision.

The technologies and solutions presented in this compilation were selected due to their relevance in the field of waste sorting technologies. However, IEA Bioenergy Task 36 does not endorse any commercial products that may be mentioned on this report.

See: http://task36.ieabioenergy.com/ for links to the work performed by IEA Bioenergy Task 36.

Summary

Food waste remains a major environmental, economic, and social challenge in Europe, with over 58 million tonnes generated annually and households accounting for the largest share. Beyond direct economic losses, food waste significantly contributes to greenhouse gas emissions and represents inefficient use of natural resources. In response, the European Union has strengthened its policy framework, most notably through the amended Waste Framework Directive, which sets binding food waste reduction targets and highlights the need for innovative and circular approaches to the management of biological resources.

Against this background, Sweden provides an advanced policy and implementation context. Mandatory separate collection of food waste, combined with a widespread biogas infrastructure, has enabled high rates of biological treatment. However, the effectiveness of these systems increasingly depends not only on the quantity of food waste collected, but also on its quality. Contamination with plastics and other materials leads to rejected feedstock, higher treatment costs, and loss of bioenergy potential, creating both economic and environmental burdens for municipalities.

This report presents initiatives in Sweden where advanced and smart technologies are key enablers for improving the handling, quality and usability of food waste, in line with the objectives of IEA Bioenergy Task 36. Automated, data-driven solutions—including sensor-based systems, AI-supported monitoring, and smart measurement technologies—offer new opportunities to detect contamination, generate high-resolution data, and support targeted interventions across the waste management chain.

The report presents a Swedish case study and ongoing initiatives that illustrate how these technologies can be applied in practice. The Sopsmart AI project in Östersund demonstrates how AI-supported image analysis integrated into collection vehicles can identify incorrect sorting at source, provide actionable feedback to households, and significantly reduce contamination risks for biogas production. Complementary initiatives, such as Tekniska verken's advanced post-sorting facility at Gärstad and a smart bin-based monitoring developed by the University of Borås, highlight how automation and digitalisation can enhance food waste recovery both at system and operational levels.

Taken together, these examples show that advanced and smart technologies can play a crucial role in improving feedstock quality for further processing, reducing unnecessary energy recovery of organic material, and enabling data-driven waste prevention and valorisation strategies. While several initiatives are still under development, the findings underline the potential of these approaches to support EU and national food waste targets and to strengthen integrated material and energy recovery systems within a circular bioeconomy.

Introduction

An overview of food waste management in Europe

In Europe only, over 58 million tonnes of food waste are generated annually, amounting to an average of 130 kilograms per person. Households account for more than half of this total, making them the largest contributors to food waste across the region, followed by manufacture of food products and beverages [1] (Figure 1).The economic, environmental and social costs associated to food waste are high[2]:

- Contribution to the greenhouse gas emissions — food waste accounts form 16% of the EU food system's greenhouse gas emissions.
- Unnecessary use of natural resources (i.e. water), energy, land, and labour that could be allocated to better purposes.
- Economic cost of handling food waste (i.e. collection and treatment) is estimated at 9.3 billion euros.
- An associated market value of food waste 132 billion euros that includes unnecessary spending by households as well as loss of resources along the food sector value chain.

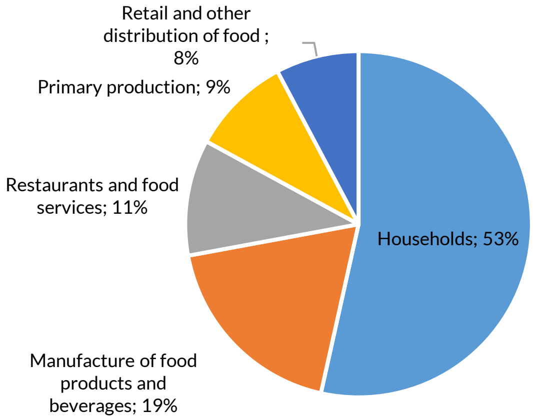

Figure 1. Food waste distribution in the EU main economic sectors during 2023. Calculations made on kg per inhabitant and each one generating 130 kg per year. Adapted from Eurostat[3].

Food waste prevention became an EU priority as early as 2015, reflected in a commitment aligned with the 2030 Sustainable Development Agenda, where the Member States pledged to halve per capita food waste at the retail and consumer levels and to reduce food losses throughout production and supply chains by 2030[4].

Over the past decade, the EU has introduced a series of policies and strategies aimed at reducing food waste and its associated impacts. The most recent milestone is the amendment[5] of the Waste Framework Directive[6,7] — still the cornerstone of EU waste legislation — which entered into force in October 2025. This amendment emphasizes the need for "*strengthened and more innovative approaches to sustainable management of biological resources to increase circularity and valorisation of food waste*". It requires Member States to take necessary measures to achieve a 30% per capita reduction in food waste generated by retail, food services, and households by 2030, using 2021-2023 as baseline. The Member States have 20 months from the Directive's publication to transpose its provisions into national law. These actions are also integral

[1] About Food Waste- European Commission. Link here. Accessed: 13/11/2025.
[2] Impact Assessment Report, SWD (2023) 421 final. Link here. Accessed: 13/11/2025.
[3] Eurostat. File: Food-waste-eu-economic-sectors-2023. Accessed: 28/11/2025.
[4] United Nations, Sustainable Development Goals (SDG) 12. Link here. Accessed: 13/11/2025.
[5] Directive (EU) 2025/1892 of the European Parliament and of the Council of 10 September 2025 amending Directive 2008/98/EC on waste. Link to the text: Directive - EU - 2025/1892 - EN - EUR-Lex. Accessed: 7/11/2025.
[6] Waste Framework Directive (Directive 2008/98/EC). Accessed: 13/11/2025.
[7] The Waste Framework Directive establishes a legal framework for waste handling in the EU and entered

to supporting the EU's transition toward a circular economy and bioeconomy.

Member States must establish national programs to help achieve the food waste reduction targets set by the EU, which in turn influence the daily practices of businesses, households, municipalities, and regional authorities. Furthermore, the quality of the food waste that continues to be generated must be sufficiently high to enable its use in bioprocesses such as biogas production and other valorisation pathways.

Sweden's leadership in Waste Management Innovation

Food waste in Sweden in 2023 amounts to approximately 1.3M tons per year, equivalent to 122 kg per person annually of which 60 kg are generated by the households[8] — a slightly better result than the European average.

Separate food waste collection from households, restaurants and industrial kitchens has been introduced progressively in Sweden since the 90s by municipalities; and since 1st of January 2024, it is mandatory for the Swedish households and businesses to sort out food waste[9]. This Swedish waste legislation derives from the European Waste directive, and municipalities are responsible for separate collection of the sorted food waste. At the time of writing (May 2026), 97% of Swedish municipalities had implemented separate food waste collection[10].

The common source separated waste collection system at a household level are four compartments' bins, separate bins or use of different colored bags for optical sorting. Furthermore, vacuum systems and underground containers are becoming more common, especially in urban areas.

Food waste treatment has evolved over the years from composting, to be processed mainly in biogas plants that produce certified biofertilizer and biogas. The resulting biofertilizer is used domestically to support food waste production. In 2025, a total of 766 030 ton of food waste generated by households was sent to biological treatment, equivalent to 72 kg per person[11]. Food waste undergoes a pre-treatment before being used as feedstock at the biogas plants and, at this point, the quality of the food waste is key. If the food waste comes with material contaminants such as plastics or small metal wires, it cannot be used as feedstock, and the material is sent to energy recovery.

Then, it is not only about source sorting as much food waste as possible but doing it correctly to ensure a good quality for further processes. Wrongly source sorted food waste and other-than-food ending up at the food waste stream cost millions of SEK to the Swedish municipalities every year, while also represents a loss of resources that could be used for bioenergy production, moving these municipalities away from sustainability.

Achieving national and EU-level goals around food waste increasingly relies on innovative solutions, including AI-based waste sorting technologies, which enable accurate identification and separation of food waste at source or during collection. These innovations not only improve the purity of the organic fraction but also support data-driven strategies for reducing waste generation and optimizing resource recovery.

Technology advancements in food waste handling

Advanced and smart technologies apply to household and businesses food waste during the source sorting, collection, transportation and treatment help maximize both the quantity and quality of the recovered material, enabling its use for renewable energy carriers such as biogas based on local resources.

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[8] Naturvårdverket: Livsmedelavfall i Sverige. Food waste from industry in Sweden. Only available in Swedish. Data revised on the 15 August 2025. Accessed: 07/11/2025.

[9] Naturvårdsverket: Krav på separat insamling av bioavfall. Only available in Swedish. Revised on the 1 October 2025. Accessed: 28/11/2025.

[10] Avfall Sverige (The Swedish Waste Management Association): Matavfall (Food Waste). Revised on the 15 September 2025. Accessed: 28/11/2025.

[11] Avfall Sverige (The Swedish Waste Management Association): Svensk Avfallshantering, rapport 2024, 2025. Only available in Swedish. Accessed: 28/11/2025.

Advanced and smart sorting technologies include AI, machine vison, sensor-based sorting, robotics, etc. and it may vary depending on the type of sorting and collection systems, or treatments. The IEA Bioenergy Task 36 report *Advanced sorting technologies for food waste*[12] provides an overview of the food waste sorting technologies available in the market from mechanical systems to artificial intelligence (AI) applications.

Purpose and Scope of the Report

Advanced and smart sorting technologies applied to food waste are highly relevant for IEA Bioenergy as it improves the quality of biogenic feedstock for biological treatment and reduces contamination across waste management systems. At the same time, automated and data-driven sorting technologies enable better characterization and system analysis of waste streams, supporting IEA Bioenergy Task 36's work on integrated material and energy valorization and climate performance.

This report presents Swedish innovative initiatives in the field of advanced and smart technology for food waste sorting and monitoring, aiming to improve the quality of the sorted food waste fraction for subsequent processes such as biogas production, while minimizing the amount generated to reduce resource loss.

The report seeks to showcase practical and forward-thinking solutions that can inspire decision-makers in shaping effective waste management strategies. By highlighting these initiatives, the goal is to support efforts to reduce food waste and enhance its quality for sustainable resource recovery and bioenergy production.

The report includes:

1- A case study about Sopsmart AI carried out by the Swedish municipality of Östersund
2- Compilation of on-going initiatives in Sweden

It is important to note that some of the projects mentioned are still under development.

[12] Advanced sorting technologies for food waste. Technology & innovative solution in Germany, IEA Bioenergy Task 36 report, 2026. Link here. Accessed: 14/04/2026.

Examples of Advanced Sorting Technologies in Sweden

AI-powered image analysis in waste collection trucks – In depth case study: Sopsmart AI – Östersund Municipality

DURATION OF THE PROJECT: 18-24 months, starting from autumn 2025

OBJECTIVE: Improve sorting accuracy and reduce contamination

BACKGROUND AND PURPOSE

Östersund is located in central Sweden and has a population of approximately 65,000 inhabitants. As in all Swedish municipalities, the municipality is responsible for household waste collection and handling, including food waste. In 2024, the municipality reported to the Swedish Waste Management Association[13] that 3,700 tons of food waste were generated, of one third was sent to composting and the rest to anaerobic digestion. Households source-sort food waste is collected in paper bags provided by the municipalities. These bags are deposited either in separate bins in single-family home areas, or in dedicated waste bins located in waste rooms in apartment buildings.

The food waste collected in Östersund and designated for biogas production goes to the Gräfsåsen facility. To ensure the efficiency of the anaerobic digestion (AD) process, the feedstock must be free from material and chemical contaminants. Waste containing material contaminants such as plastics or metals is therefore rejected, as these materials interfere with the biological treatment and cannot be processed. The municipality estimates that each month, around 4,000 waste bins from households contain incorrectly sorted waste. Local statistics show that in single-family homes, about 5.2% of the food waste is wrongly sorted, compared to 4.7% in apartment complexes areas. Currently, rejected food waste is either transported by truck to Sundsvall, a nearby municipality, for incineration with energy recovery, or it undergoes a manual post-sorting process to remove contaminants. However, both alternatives involve significant economic and environmental costs.

To address this issue of wrong sorting, the municipality has decided to invest in AI-based technology integrated with food waste collection systems. This initiative aims to prevent contamination at the source and improve the quality of collected food waste. This technology will enable Östersund to gain valuable insights into 1) frequency of incorrect sorting; 2) the most common types of contaminants; and 3) the effectiveness of various communication strategies and household-targeted interventions.

This project supports the municipality's long-term waste management goals: increasing source sorting yield, reducing the among of food waste that goes to energy recovery, and contributing to a more sustainable society. These objectives are aligned with the EU Waste Framework Directive[14].

TECHNOLOGY DESCRIPTION

The technology has been provided by Sortrace, a Swedish cleantech startup specialized in AI-driven waste monitoring solutions. The technology combines AI-driven image analysis with camera-equipped waste collection trucks to monitor contamination in real time. The system encrypts and processes data securely in an EU-based cloud, generating actionable dashboards that pinpoint sorting errors and contaminating hot spots such as specific households that usually sort food waste wrongly.

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[13] Avfall Web is the Swedish Waste Management Association's (Avfall Sverige) statistics tool that gives municipalities the opportunity for comparisons, benchmarking and analyses. The system also forms the basis for the national statistics on municipal waste that Avfall Sverige produces each year. Avfall Sverige supplies statistical data to, among others, the Swedish Energy Agency, the Swedish Environmental Protection Agency and Statistics Sweden.

[14] Waste Framework Directive - Environment - European Commission. Accessed: 06/11/2025.

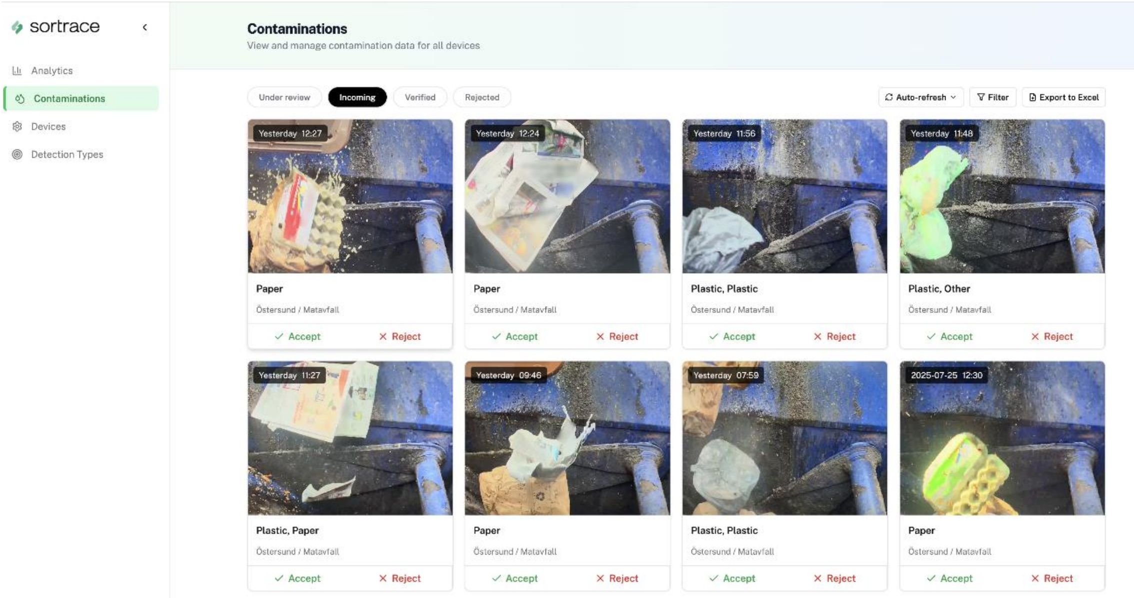
In practice, camera-based sensors have been installed on two trucks that collect food waste within the municipality. The system captures images when bins are emptied. These images are anonymized in real time by removing any personal details — such as faces, text on documents, or surrounding context— so that only material contaminants remain visible (e.g. plastic or small metal wires). When the camera detects a bin that may contain incorrectly sorted material, the system sends a signal to the driver, who then takes over the process. Only images showing food waste with sorting errors are stored.

Table 1. Parameters related to food waste source sorting in the municipality of Öresund during 2024. Data collected from Avfall Web, Avfall Sverige[13].

Parameters	Singel-houses	Apartments
Amount of food waste generated (kg/household/week)	2,67	1,06
Share of the sorted food waste out of the total amount generated by the households (food waste + residual waste) (%)	60	86
Share of food waste from households (%)	16,1	23
of which proportion of avoidable food waste (%)	40	35
Share of wrongly sorted food waste (%)	5,2	4,7

Figure 2. Food waste contaminated with plastics. The AI-based system detected the contaminants, captured an image, and recorded the data for analysis. Source: Östersund municipality.

Figure 3. Image of the platform used by truck drivers. It displays photos of contaminant materials detected during the emptying of food waste bins. Drivers review the images and confirm whether the system's detection is accurate.



IMPLEMENTATION AND EVALUATION

In October 2025, the project entered a test and evaluation phase scheduled to last 18 to 24 months, with initially two garbage trucks equipped with AI technology. Throughout this period, the municipality is collecting data on the frequency of missed collections and identifying the most effective measures to improve sorting. The system and analysis platform are continuously updated based on feedback and lessons learned.

Preliminary results indicate that this technology is highly efficient in detecting plastic contaminants in food waste compared to previous standard routines. Initially, the AI will focus solely on food waste, but if it performs as expected, its application could be extended to residual waste.

At this stage, the system has only been tested in waste from single houses. Results show that the system detects an average of 10–20 sorting errors per day, making it possible to identify patterns, such as recurring plastic contamination in food waste from specific addresses[15].

INVESTMENT& FUNDING

The total investment in the project amounts to SEK 1.1 million. The project is partially financed by Östersund Municipality, with its contribution distributed over a 20-month period, and by the Swedish Waste Management Association, which provided funding to support the evaluation phase.

[15] Avfall och Miljö nr 1 2026. Link: Avfall och Miljö nr 1 2026 (only available in Swedish). Accessed 14/04/2026.

IMPACT

HOUSEHOLDS

Under the current collection system, some local drivers—specifically those operating backloaded trucks, but not side loaders—have the possibility to identify incorrect food waste sorting, and households get a fine if the issue persists. As of 2025, the fee is 230 SEK.

The implementation of the new AI technology will enable real-time, anonymized data analysis and collection of household sorting statistics. Households will be notified when incorrect sorting is detected, and repeated violations may result in fines. In addition to improving compliance, the technology simplifies drivers' daily tasks and contributes to a better working environment.

MUNICIPALITIES

Östersund Municipality estimates that approximately 40–50% of food waste is incorrectly sorted. Increasing correct food waste source sorting could result in annual savings of about 5–6 million SEK in processing costs, with additional savings from reduced transport to Sundsvall. Furthermore, food waste must meet specific quality standards to be processed into biogas at the local facility in Östersund. Currently, plastics are removed manually, or entire batches are classified as residual waste if contamination levels are too high—an expensive process that also leads to the loss of valuable material for biogas production. Östersund municipality has not yet fully summarized these figures, but the potential benefits seem clear.

The information collected by the system will be used by the municipality to inform households and influence their sorting behaviour.

ENVIRONMENTAL

The implementation of AI-based sorting technology will have a significant environmental impact. By reducing plastic contamination in food waste, the system prevents plastic and microplastics from entering biogas production and agricultural soils. Improved sorting quality allows more food waste to be processed into biogas rather than being discarded as residual waste, supporting bioenergy generation and reducing dependence on fossil fuels. Additionally, fewer transports and less incineration of residual waste lower greenhouse gas emissions. Overall, this technology promotes resource efficiency and strengthens the circular economy by maximizing the recovery of energy and nutrients from organic waste.

FUTURE OUTLOOK

Although the project is still in its implementation phase, preliminary results suggest that the system can significantly save resources, and several municipalities in Sweden have already expressed interest, and to the best of our knowledge, similar projects are being started by other municipalities.

Currently, the system is being tested on food waste. Once this phase is complete, trials will expand to residual waste, followed by other recyclable fractions such as plastic, paper, glass, and metal; and it can be used in other types of waste collection vehicles as well.

Gärdstad: Advanced sorting technologies for food waste (Tekniska verken)

Tekniska verken is a municipally owned multi-utility company based in Linköping, Sweden, and give waste handling-related services to around 200,000 people. It is fully owned by the City of Linköping and is responsible for providing and operating essential infrastructure services for the region including waste management and recycling, biogas production, district heating, etc.

Tekniska verken is developing and commissioning a highly automated post-sorting facility at the Gärstad site – an integrated waste-to-resource hub - in Linköping. The plant is designed to mechanically separate five material fractions from residual household waste: plastic, paper/cardboard, ferrous metals, non-ferrous metals, and food waste. It is the first facility in Sweden to achieve five-fraction sorting in a single integrated process (Table 2).

The Gärstad plant uses automated, sensor-based sorting supported by advanced data processing and sensor fusion, rather than manual sorting. While the system is highly digitalized and data-driven, it is not publicly described as relying on fully autonomous AI-based classification.

The identification and separation of food waste and other fractions are performed using a combination of advanced, sensor-based technologies, including optical near-infrared (NIR) sensors for material identification; sensor fusion, combining data from multiple detection systems; magnets and eddy current separators for metal separation and highly automated conveyor and control systems enabling continuous operation. Food waste is identified as a distinct organic fraction and separated from the residual waste stream using these automated systems, enabling downstream biological treatment[16].

The sorted food waste fraction is transported to a biogas facility, where it is converted into biogas and biofertilizer, while remaining residual waste is sent to the adjacent combined heat and power (CHP) plant for energy recovery. This system configuration enables biological treatment while reducing the share of biogenic material sent to incineration.

The Gärstad plant demonstrates how advanced, automated sorting technologies can be applied to recover food waste from mixed household waste streams at scale, complementing source-separated collection systems. By enabling high-resolution separation of organic material, the facility supports: Improved feedstock quality for biogas production; reduced contamination in downstream processes and data-driven optimization of waste flows and treatment pathways.

[16] Framtidens sorteringsanläggning är startklar: Link: https://www.tekniskaverken.se/om-oss/hallbarhet/miljo/sorteringsanlaggning/. Accessed 15/04/2026.

Table 2. Technical and Operational Overview of the Gärstad Integrated Waste Sorting and Energy Recovery Facility.

Category	Data / Description
Operator / Owner	Tekniska verken i Linköping AB (municipally owned utility company)
Location	Gärstadområdet, Linköping, Sweden (adjacent to CHP/WtE plant)
Facility type	Integrated waste-to-resource hub including post-sorting, waste-to-energy (CHP), and links to biogas production
Main function	Automated post-sorting of residual household waste prior to material recycling, biological treatment, and energy recovery
Waste input type	Mixed municipal residual waste (household and similar waste streams)
Sorted fractions	Plastic, paper/cardboard, ferrous metals, non-ferrous metals, and organic waste (food waste
Sorting technology	Optical NIR sensors, sensor fusion, electromagnets, eddy-current separators, automated control systems
Treatment of food waste	Separated organic fraction sent to biogas production (biogas and biofertiliser)
Residual waste treatment	Energy recovery in on-site combined heat and power (CHP) plant (WtE)
Design capacity	~200,000 tonnes of mixed waste per year (≈40 t/h)
Building size	~8,000 m^2
Commissioning / status	Construction completed 2025; test operation and commissioning during 2026 Inaugurated in February 2026.
Estimated CO_2 reduction	~77,000 tonnes CO_2-eq per year (through increased material recovery and reduced fossil-based incineration)
Investment cost	> SEK 400 million (partly supported by national funding, e.g. Klimatklivet)
Role in system	Complements source separation; recovers mis-sorted materials and food waste from residual streams

Smart bins for real-time food waste monitoring (University of Borås)

The University of Borås, Sweden, has initiated a research study aimed at improving knowledge about food waste, including its characteristics and quantities. As part of this work, a smart bin–based measurement method is being developed to quantify and characterize food waste in settings such as households, nursing homes, restaurants, etc. The method combines automated data collection with structured data processing and multi-level categorization.

The smart bin is equipped with an integrated weighing system that automatically records the weight of food waste at the time of disposal[17], [18]. A camera installed above the scale captures images of the discarded items simultaneously. For each disposal event, weight and image data are collected and processed by a single-board computer, which transfers the data to a central server for secure storage and backup. The categorization of waste items was made manually by researchers using a custom-build online interface. The smart bins have been developed in collaboration with Vepred AB, a technology company building AI-powered solutions food waste data.

A case study was carried out in a nursing home in Borås during 2024 to evaluate the feasibility of the approach. Preliminary results were analyzed from several perspectives, including weekly food waste volumes across meals and overall waste distribution by type and composition. The results indicate that the method enables detailed monitoring of food waste patterns and has potential for scalable, long-term application in institutional environments, forming a basis for future data-driven analyses and interventions[19]. The smart bin is currently being tested at household level in the city Borås[20] and this study is expected to provide detailed information on the amount and type of food waste generated. This information could be used to inform households and provide support on measures that could lead to reduce food waste. The project started in spring 2023 and will be completed in 3 years.

In parallel, the Swedish University of Agricultural Sciences is also working with a similar technology concept that has been tested in 41 Swedish households where their food waste was monitored over almost 10 000 days (April 2023 - January 2025). Results showed that 24.4% of food waste was edible food and 7.3% was possibly avoidable, indicating a prevention potential of 31.7% in total food waste. These two fractions combined had a carbon footprint of 19 kg CO_2e and a cost of €66 per person per year[21].

Figure 4. Real-time food waste photo. Source: University of Borås. Fel! Bokmärket är inte definierat..

[17] Rethinking household food waste quantification: Increasing accuracy and reducing costs through automation. Sjölund, A. et al. *Environ. Technol. Innov.* 37, 103993 (2025). https://doi.org/10.1016/j.eti.2024.103993
[18] Unveiling the hidden patterns of household food waste, Sjölund, A. et al. *Curr. Res. Environ. Sustain.* 9, 100292. https://doi.org/10.1016/j.crsust.2025.100292 (2025).
[19] Tacking food waste in nursing homes: A measurement method using smart bins. Liu et al., Waste Management, vol. 203, 2025. https://doi.org/10.1016/j.wasman.2025.114858
[20] Living Lab – Household Food Waste Reduction Using Smart Bins, University of Borås. Link: Living Lab – Household Food Waste Reduction Using Smart Bins - University of Borås. Accessed 14/04/2026.
[21] Quantifying the realistic reduction potential of food waste in Swedish households, Sjölund A. et al., Scientific reports 16, article number 4323 (2026). https://doi.org/10.1038/s41598-026-37302-7.

Key Takeaways & Conclusion

The Swedish examples presented in this report demonstrate that advanced and smart technologies can play a crucial role in improving both the quantity food waste collected for biological treatment and minimizing food waste generation. While Sweden already benefits from mature source-separation systems and well-established biogas infrastructure, the cases show that contamination and data gaps remain key challenges limiting the full valorisation potential of food waste.

Digital and automated solutions—such as AI-based monitoring in collection vehicles, advanced sensor-based post-sorting facilities, and smart bins for real-time measurement—offer complementary approaches to address these challenges. They enable early detection of sorting errors, improved feedstock quality for biogas production, and high-resolution data that supports targeted interventions and waste prevention strategies.

A key lesson is that technology alone is not sufficient; its value lies in how it is integrated into existing waste management systems and combined with communication, feedback mechanisms, and policy frameworks. The initiatives described illustrate how data-driven insights can support municipalities in reducing costs, improving environmental performance, and advancing circular bioeconomy goals.

Overall, advanced sorting and monitoring technologies represent a promising enabler for meeting EU and national food waste targets, reducing unnecessary loss of organic material, and maximizing renewable energy and nutrient recovery. As several of the highlighted initiatives are still under development, continued evaluation and knowledge sharing will be essential to scale up successful solutions and replicate them across different local contexts.

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