

Collaboration Initiative Food Loss and Waste launched at MACS-G20

2023 update on activities



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1 Preface

In 2023, the Collaboration Initiative Food Losses and Waste launched at MACS-G20¹ finished its eight year. The impact of the global Covid-19 pandemic is still an issue in global food supply chains and the Ukrainian war has continued to have major effects on global food availability. Fighting against food loss and waste was an issue during the G20 presidency in India. Cooperation between research, policy and practice as well as a more interdisciplinary approach was requested in many discussions throughout the year. Let's contribute to these issues together!

As in previous years, we - Stefan and Felicitas from the Thünen Institute (Federal Research Institute for Rural Areas, Forestry and Fisheries) - invited our Initiative partners to contribute to the present report with a brief summary not only on our joint but also on their own or further ongoing national FLW activities. This approach supports our aim to share knowledge and experiences within our global network. Enjoy!

2 Introduction

The Collaboration Initiative on Food Losses and Waste launched at MACS-G20 was founded in 2015 at the MACS-G20 in Izmir, Türkiye. Germany took leadership of the Initiative and from 2015 until mid-2017, Stefan Lange who is the research coordinator at the Thünen Institute and part of the German MACS-G20 delegation, was responsible for the German contribution to that FLW Initiative. Since mid-2017 he supervises the coordinator and takes part in selected activities. Since then, Germany has been financing the position of a coordinator. The coordinator is located at the Thünen Institute in Braunschweig (Germany). This position is filled by [Felicitas Schneider](#).

The aim of this report is to summarise already completed and ongoing activities derived from our FLW Initiative, to foster the sharing of knowledge and experience and to invite interested G20 and further countries and stakeholders to participate in joint activities. The present report **provides a brief update and summarises the activities in 2023**. In addition, we asked our collaboration partners **to provide a brief insight into their activities beyond the Initiative as well as some country news** in order to provide a broader picture.

This report is published at the Thünen [project site](#), at the MACS-G20 [Collaboration Initiative site](#) and in addition sent out per e-mail to a selected group of interested people dealing with the issue of food loss and waste. Most of them participated in the kick-off workshop held from June 20th to 22nd 2017 in Berlin where participants from 17 countries as well as from FAO, OECD and EU-Commission were present. Furthermore, the report is sent out to the subscribers of our [Global FLW Expert and Project database](#). If you are also interested in receiving information on the activities, please do not hesitate to contact the coordinator by writing an e-mail to felicitas.schneider@thuenen.de and by visiting the website of [FLW Initiative](#). You are always welcome!

If you are interested in learning more about our Initiative and if you wish to contribute, please do not hesitate to contact the coordinator. Furthermore, if you have additional ideas or wish to host a FLW workshop or contribute to the prevention of FLW with any other approach, please contact us!

The activities derived from the Collaboration Initiative FLW launched at MACS-G20 focus on G20 members but are not restricted to them. As the food supply chain is global, our activities also address global interaction and include non-G20 members in order to consider inter- and transdisciplinary issues, interactions between different levels of the food supply chain and the corresponding actors as well as the impact of local framework conditions.

¹ MACS means Meeting of Agricultural Chief Scientists, more details see [here](#). G20 is the international forum which brings together more than 80 % of world GDP, 75 % of global trade and 60 % of the population of the planet. Further details see [here](#).

3 Overview on activities within the Initiative and beyond

Our activities - finished within this year as well as ongoing - are briefly described according to the main topics of the FLW Initiative (Figure 1).

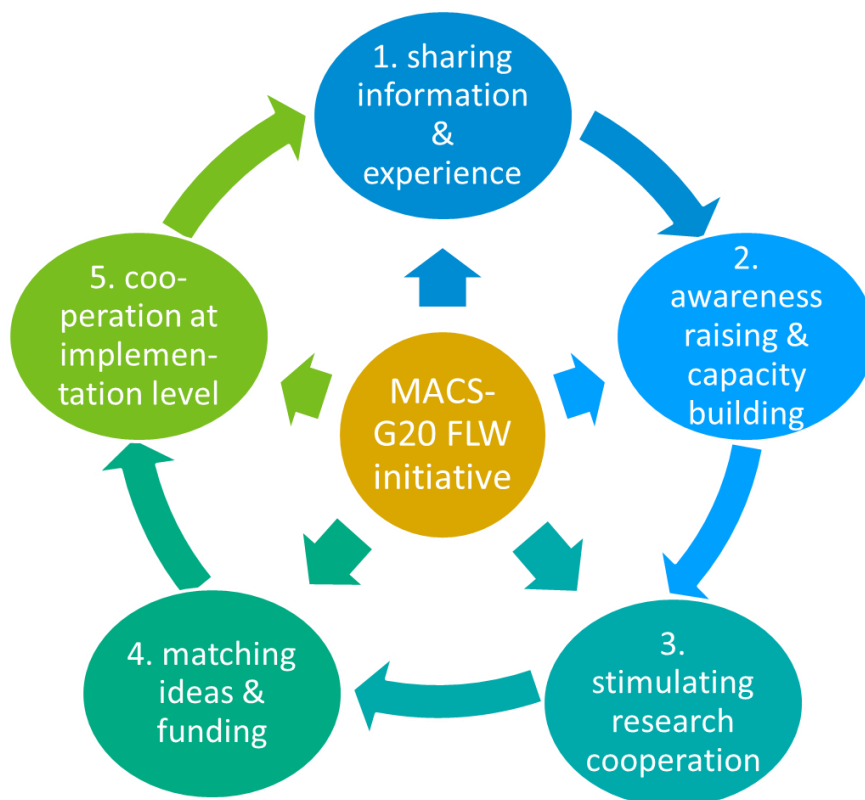


Figure 1 Scheme of the main topics of Collaboration Initiative FLW launched at MACS-G20

3.1 Topic 1: Sharing information & experience

3.1.1 Global Food Loss and Waste Research Platform

The Global Food Loss and Waste Research Platform is an [international database](#) where experts register in order to make their contact information and their FLW projects more visible on a global level. Aim of the online Platform is to offer easy access to focused information for policy decision makers, companies and researchers to facilitate network building, knowledge sharing and corresponding action.

Unfortunately, due to technical problems during the relaunch of the Thünen website, the Research Platform has **not been available from end of August 2022 to March 2023**. This effected not only our statistics but also our reputation and we apologise for any inconvenience to our experts due to the unavailability of the database. All interested colleagues are now welcome to again contribute further knowledge to the database by inviting additional experts also from non-G20 countries to register and to use the content for their own investigations and network establishment.

Since its launch in spring 2016, 167 researchers from 42 countries entered their contact data into the database (Figure 2). It can be seen that some countries such as Germany, Italy and Türkiye are very well represented while most countries contribute with one expert. Our goal is to reach more experts in those countries and motivate them to register which also could foster national networks.

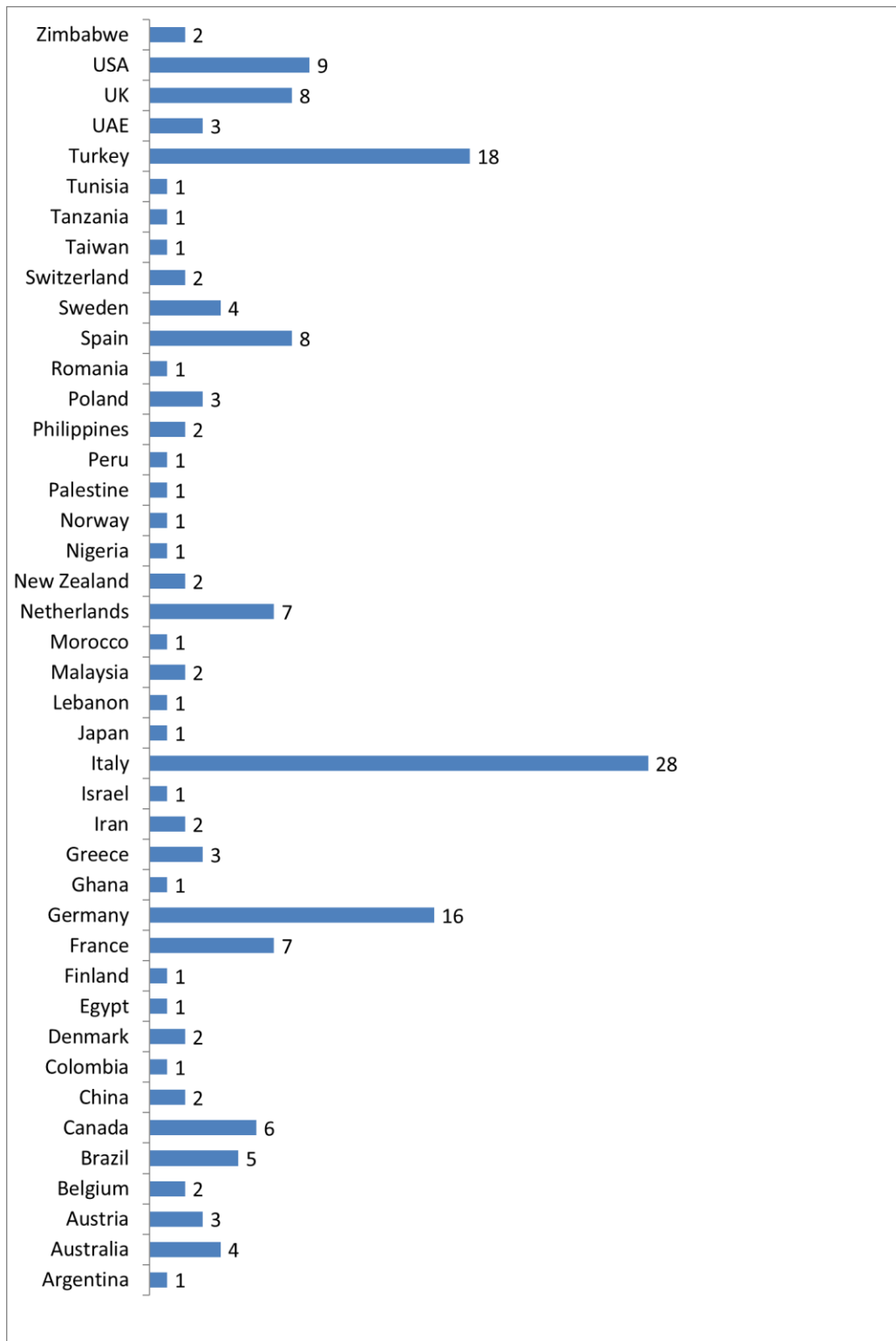


Figure 2 Number and countries of registered experts in the Global Food Loss and Waste Research Platform (as of mid December 2023), UAE... United Arab Emirates.

In order to obtain evidence of the Platform’s recognition at global level, a set of facts were assessed in relation to the website’s access rates. From mid December 2022 to mid December 2023 (although not available three months in 2023), 2,359 accesses from 90 different countries were counted for the website in total which represents a 12 % increase of access compared to recent years. Figure 3 shows the visitors’ countries of origin wherever this could be tracked. The majority of the visitors came from USA, Germany, Netherlands, China,

Canada, UK, Poland, Australia, France, Italy, and Spain with more than 50 different counts. Looking at the origin of users by continents, the American continent ranks slightly prior to Europe and followed by Asia. In total, all continents are represented by at least 35 unique accesses. For our activities we conclude that we successfully implemented further global contacts, increased our range and visibility.

We were able to stabilise the number of visitors who directly contacted our website; it remained more or less the same as last year (at 1,854 visitors or 78 %). 392 visitors (17 %) were redirected from other websites, further 113 were directed to the website by using search engines (5 %). Those numbers show a surprising increase of indirect visitors which may be explained by better citation of our website on websites of partnering organisations.

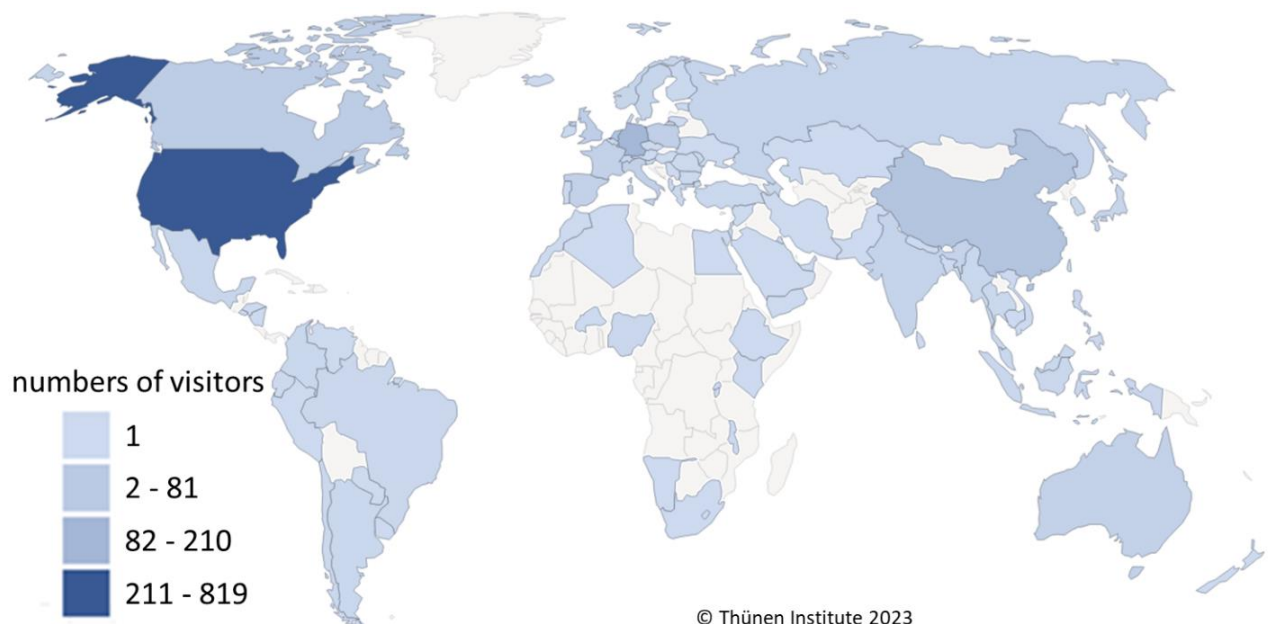


Figure 3 Numbers of visitors at the Global Food Loss and Waste Research Platform in 2023

3.1.2 G20 under the presidency of India

The Indian G20 presidency in 2023 was promoting the slogan “One Earth, one Family, one Future”. The meeting of Agricultural Chief Scientists of G20 (MACS-G20) took place from April 17 to 19th, 2023 in Varanasi. Stefan Lange as one of the German delegates and supervisor of the Collaboration Initiative was invited to provide input towards “Digital Technological Solutions for reducing Food Loss and Waste” as starting point for further discussions. Please read more about our valuable cooperation with our Indian colleagues in chapter 3.1.3.

3.1.3 7th Regional FLW Workshop in New Delhi/India

One aim of our activities is to organise an annual Regional FLW Workshop. In order to take the G20 responsibility into account more, the workshops are a cooperation of the Thünen Institute with partners from the corresponding G20 presidency country and they target the neighbouring region of that country. The workshop series started with the [kick-off workshop](#) in Berlin/Germany in 2017. It was followed by a Regional FLW workshop organised for Latin America and the Caribbean countries (LAC) in November 2018 in [Buenos Aires/Argentina](#). In 2019, the target region included Southeast and East Asian countries while the workshop took place in [Tokyo/Japan](#). The first hybrid [workshop](#) was conducted in collaboration with Saudi Arabia in 2020 targeting Gulf Cooperation Council Countries plus the Yemen. Our first complete [online workshop](#) during the Italian G20 presidency in 2021 targeted the Mediterranean countries. In 2022, we reached a new record of more than 500 participants in our hybrid workshop held in Indonesia. All video recordings of the sessions including English subtitles together with a summary and a selection of photos can be found at our [website](#).

In 2023, our committed Indian partners from the Indian Council of Agricultural Research (ICAR) took over the official invitations, the organization and hosting on site. Colleagues from the United Nations Environment Program (UNEP) and the University of Peradeniya (Sri Lanka) complemented the team. The target region this year included countries in South Asia which are Bangladesh, Bhutan, India, Nepal and Sri Lanka. From October 30th to November 3rd, 2023, a total of 120 participants from 8 countries discussed the focus on losses in primary production, food waste in households and communities as well as the role of the circular economy and social institutions (Figure 4). The contributors represented ministries, universities and other private and public research institutions, non-governmental organizations, social institutions, international organizations, consulting and waste management companies, regional authorities and food companies. The German Embassy in India was represented by Ms Ingeborg Bayer during the whole workshop.



Figure 4 Around 120 participants joined the plenary sessions of the workshop (credit: ICAR)

In the presence of the Indian Minister of State for Agriculture and Farmers' Welfare, Hon. Sushri Shobha Karandlaje, the traditional lighting of a lamp was celebrated as a prelude to successful joint activities in preventing losses and waste (Figure 5). A pledge read out by all participants that they would personally work to reduce losses and waste complemented the ceremonial start of the workshop.

The opening session was kindly chaired by Dr Himanshu Pathak, ICAR Director General (Figure 6), and Stefan Lange, Research Director at Thünen Institute. All further sessions were also chaired by acknowledged experts supported by experienced co-chairs and rapporteurs who provided notes for the final proceedings of the workshop (which you can find [here](#)).



Figure 5 Traditional lighting of a lamp in presence of Hon. Sushri Shobha Karandlaje, Indian Minister of State for Agriculture and Farmers' Welfare (credit: ICAR)



Figure 6 Dr Jha, ICAR DDG (right), presents flowers to Dr Himanshu Pathak, ICAR Director General (left) (credit: ICAR)

Each of the technical themes of the workshop were outlined in short presentations before everyone attending contributed to the discussion with their questions, comments and experiences (Figure 7). The range of topics included, among other things, work on reducing post-harvest losses, the development of sensors for optimal storage and packaging, optimisation in the cold chain, the use of artificial intelligence and blockchain technology, the influence of cultural and social norms, and traditional indigenous knowledge in preservation, circular

economy and valorisation of by-products. During the discussion phases and breaks, valuable contacts were made and experiences were exchanged personally. As most of the participants stayed at the International Guesthouse on-site, further valuable exchange took place during breakfast and dinner.



Figure 7 The family photo of the participants on day 2 of the workshop (credit: ICAR)

The specialist excursion took us to the exemplary logistics of a parastatal company named Mother Dairy Fruits and Vegetable Pvt Ltd. that supplies the Indian capital with fruit and vegetables - both fresh and processed in-house. We would like to thank Mr Pradipta Kumar Sahoo for the warm welcome, the generous hospitality and great opportunity to learn from best practice!



Figure 8 Mr Pradipta Kumar Sahoo, Business Head of Safal & International Business from Mother Dairy Fruit & Vegetable Private Limited welcomes the visitors (credit: ICAR)

The agenda, a comprehensive [summary](#) as well as some photos are provided at the Initiative’s [website](#). Some of the presentations are already available, others will follow after the presenters’ legal approval of the content.

We would like to thank our cooperation partners, and all colleagues from the ICAR team, the presenters, chairs and co-chairs who contributed to the success of the workshop. We would like to highlight the professional performance of the whole Indian team, especially Dr Shyam Jha, Dr Devinder Dhingra, Dr Kairam Narsaiah, Dr Nachiket Kotwaliwale, and the ICAR organisation team, especially Ms Shabnam Kumari, as well as Dr Asela K. Kulatunga from University of Peradeniya (Sri Lanka), the UNEP team around Ms Clementine O’Connor for their valuable support of the FLW workshop!

We look forward to our Regional FLW Workshop in cooperation with Brazil in 2024!

3.1.4 European Platform on Food Losses and Food Waste and European Food Waste reporting

The second year of the EU Platform FLW term 2022 to 2026 was characterized by interesting developments and joint meetings with other stakeholder groups. For more detailed information e.g. on agendas, recordings and presentations of all platform meetings or the list of members for the different sub-groups, please see the official [website](#). Our coordinator Felicitas represents Thünen Institute in the EU Platform as well as the subgroups “measurement”, “action and implementation” as well as “consumers”.

In addition to the EU Platform FLW, the [European Citizens’ Food Waste Panel](#) had its first meeting in December 2022. Aim of that Panel was the contribution of citizens to the European Commission’s legislative proposal covering legally binding targets for member states. In February 2023, the Panel already submitted [23 recommendations](#) to the Commission in order to speed up food waste reduction in the European Union. Those recommendations were discussed with the Commission’s representatives and the EU Platform FLW on November 7th, 2023. You can find the presentations and the recording of that meeting [here](#).

The results of the first EU-wide food waste monitoring (data sets for 2020) were presented and discussed in a joint meeting of the EU Platform FLW and the [Advisory Group on Sustainability of Food Systems](#) on March 13th, 2023. Again, the agenda and presentations can be found [here](#).

The second obligatory European food waste reporting for the year 2021 showed a stable food waste generation per capita, with 131 kg per inhabitant (2020: 127 kg/cap.yr) according to European Statistical Office (Eurostat). In addition, the share of the different levels of the food supply chain did not vary significantly: households contribute with 70 kg/inhabitant (54 %), food processing with 28 kg/inhabitant (21 %), primary production with 11 kg/inhabitant (9 %), food service with 12 kg/inhabitant (9 %) and finally retail and other distribution with 9 kg/inhabitant (7 %). The figures are rounded.

It has to be mentioned that the Czech Republic, Germany, Greece, Spain, Cyprus and Malta did not submit new data for 2021, thus data sets from 2020 were used to calculate the European averages. It is expected that those data sets will be updated by the end of the year. More information can be found at the corresponding [website](#) of Eurostat.

In order to better address evidence-based, practical solutions to reduce food waste at the household and food services level, the Joint Research Centre organized the [European Consumer Food Waste Forum](#) in collaboration with the Directorate-General for Health and Food Safety (DG SANTE) in 2021. In June 2023, the developed tools were presented and discussed at the European Parliament. You are welcome to have a look at the Compendium, the recommendations for different stakeholders as well as the FW Prevention Calculator on the Forum’s Website.

3.1.5 Update on FLW activities in Brazil²

The Brazilian Agriculture Research Corporation (Embrapa) celebrated 50 years in 2023. Embrapa has a long tradition in developing technological assets that contribute to reducing food losses and waste, such as edible films for application to fruits, intelligent packaging, and post-harvest handling practices for fruits and vegetables. Furthermore, this Brazilian public company has led social innovation actions with partners, contributed to the implementation of food policies and also supports international organizations in discussing and proposing policies aimed at fostering the sustainability of food systems. Brazil is leading G20 in 2024, and Embrapa will host the next MACS-G20 meeting next April. The annual workshop of the MACS-G20 Collaboration Initiative Food Losses and Waste will also involve Embrapa in 2024.

² The following section was kindly provided by Gustavo Porpino and Priscila Bassinello from Embrapa Foods and Territories/Brazil.

In 2023, the Cities and Food project (see Figure 9, Figure 10 and Figure 11), led by Embrapa Foods and Territories (Maceió, Brazil) as part of the European Union – Brazil Dialogues Facility, carried out a case study in five Brazilian cities (Curitiba, Maricá, Recife, Rio Branco and Santarém) to analyse data about the governance of urban food systems and identify good practices aligned with circular food systems. Furthermore, in Curitiba, Recife and Rio Branco, a waste composition analysis from street markets was conducted in order to quantify food waste. This project involved the Urban Laboratory of Public Food Policies (Luppa), a collaborative platform for the development of integrated, participatory, and systemic municipal food policies in Brazil led by Comida do Amanhã Institute.



Figure 9 Cities and food: a Brazilian delegation, led by Embrapa, visited Valencia (Spain) and other four European cities in 2023 in a technical mission aimed at discussing urban circular food systems. Photo: Mayara Guimarães.



Figure 10 Cities and food: Embrapa is engaged in promoting the Milan Urban Food Policy Pact in Brazil with partners. Photo: Mayara Guimarães



Figure 11 European Commission: Brazil and Europe have cooperated in research projects to mitigate food waste. Photo: DG RTD / EU Commission.

More than 30 Brazilian cities are engaged in the Luppa network. You can find an English summary of the research report of the Cities and Food Project [here](#) or by using the QR code in Figure 12.



Figure 12 QR code for English summary of the research report of the Brazilian Cities and Food Project.

Throughout 2023, Embrapa and partners organized the following activities aligned with food losses and waste mitigation:

- **Urban circular food systems webinar**

This [online discussion](#) involved more than 30 representatives from Brazilian cities aiming at presenting opportunities for policy makers to foster urban circular food systems. Gustavo Porpino, researcher at Embrapa Foods and Territories; Cláudia Alves, food policy officer from Funchal (Portugal); and researcher Mia Reiss (FAO Americas) debated the topic with the audience. The activity was part of the Cities and Food project, a joint initiative of Embrapa and the European Union Delegation to Brazil. The webinar was co-organized by Luppa.

- **Training for school chefs and workshop on school feeding**

In 2023, Embrapa and partners have trained 705 school cooks and 49 nutritionists from 21 municipalities from Alagoas state, in the northeast of Brazil. This initiative involves the Brazilian Support Service for Micro and Small Enterprises (Sebrae) and the National Service of Commercial Learning (Senac). These capacity building efforts aim to raise awareness in the municipal public sector to strengthen food procurement from smallholders, and to encourage the full use of foods among the school cooks. In this [video](#) you can find more information.

The training involved nutritionists of each public school in order to help provide information about the current school menu, and to decide which ingredients from smallholders were available to be used in new recipes. The culinary techniques, good handling practices, the use of different parts of regional foods, the food reusing and food waste concepts were also introduced and discussed during the practical workshops.

The school cooks training was part of the fourth edition of the “school cooks competition”, coordinated by Sebrae in partnership with Embrapa Food and Territories and Senac. The three best recipes proposed by the participating municipalities, according to the criteria of appearance, texture, flavour, creativity in the use of ingredients from family farming and local biodiversity were awarded prizes.

The preparations had to be based on fresh or minimally processed foods, respecting nutritional needs, eating habits and the region’s food culture, based on sustainability, seasonality and agricultural diversification in the region and promoting adequate and healthy eating. The recipe also needed to be replicable in the school context. This initiative values the work of school cooks (Figure 13) and it connects different actors from farm to table as a means to improve the quality of school meals in a region with severe socioeconomical vulnerability.



Figure 13 Training for school cooks from Alagoas (Brazil) highlighted the use of the palm plant as an alternative healthy ingredient in school meals. Photo: Gustavo Porpino.

- **Cities and food international seminar**

The hybrid event, held at the Brazilian Social Service of Commerce (SESC) in September in Rio de Janeiro, involved 115 participants from several municipalities, and representatives from FAO, European Union, universities, and Brazilian ministries (Figure 14). Apart from the discussion of the Cities and Food study results, the seminar also included the participation of European cities engaged in the knowledge exchange, represented by officials from Ghent (Belgium), Turin (Italy) and Valencia (Spain). SESC, responsible for the coordination of the main Brazilian network of food banks, presented an initiative to reduce vegetable losses in Nova Friburgo (RJ) and offered a sustainable brunch with local products. A video is available [here](#).



Figure 14 Urban circular food systems: knowledge exchange between European and Brazilian cities involved Embrapa and partners in Rio. Photo: Noelia Barriuso.

- **Workshop reducing food losses and waste: agricultural initiatives for sustainability**

The Brazilian Ministry of Development and Social Assistance, Family and Fight Against Hunger (MDS) announced that the Intersectoral Strategy for Reducing Food Losses and Waste, developed in 2018 by a working group from the Interministerial Chamber of Food and Nutritional Security (Caisan), will be updated in 2024. The initiative will define the governance that will act on food losses and waste mitigation, including the role of each ministry in achieving the objectives. The announcement was made during the workshop “Reducing Food Losses and Waste: Agricultural initiatives for sustainability” (Figure 15), promoted by the Ministry of Agriculture and Livestock (Mapa), in November in Brasília, with the participation of Embrapa, FAO, Pact against Hunger, SESC, Brazilian Association of Supermarkets and partners.



Figure 15 Workshop at the Brazilian ministry of agriculture involved several actors from the food chain. Photo: Gustavo Porpino.

- **Post-Harvest Technology Course in Fruits and Vegetables**

How can Artificial Intelligence impact the post-harvest of fruits and vegetables and contribute to reducing food losses and waste? This was the central question that motivated Embrapa Instrumentation to organize a panel with experts, in November in São Carlos (SP). This initiative is part of the Post-Harvest Technology Course in Fruits and Vegetables, launched in 2011. Since the 2021 edition, the course is available at Embrapa's distance learning platform “e-Campo”. It has reached 7650 registrations from all Brazilian states and participants from 11 countries

from Africa, Europe, Central America and South America. Furthermore, to increase the transfer of technologies to rural producers, the Embrapa Regional Technologies Meeting was organized in three municipalities in the state of São Paulo (Figure 16). The Agricultural Cooperative of Ibiúna, a vegetable production hub in São Paulo state, hosted a seminar about good practices in harvesting and post-harvest, packaging, labelling and traceability. Additional information can be found [here](#).



Figure 16 In-person dissemination of post-harvest fruit and vegetable technologies has taken place in several Brazilian cities in 2023, such as Sorocaba (SP). Photo: Edilson Fragalle

3.1.6 Update on FLW activities in Canada

3.1.6.1 Food processing innovation: from brewer's spent grain toward a promising ingredient for ready-to-eat food products³

In 2023, [Station Agro-Biotech \(Bilboquet Microbrewery\)](#) and [Saint-Hyacinthe](#) Research and Development Centre of Agriculture & Agri-Food Canada continued to gathered their expertise and effort in an ongoing collaborative project aiming to characterize the attributes of food matrices produced from brewer's spent grain (BSG) at the pilot scale using a "Circular Agri-Food Systems" approach (see also last year's [annual report](#)). This year, the focus has been put on the characterization of the microflora found in BSG and on the assessment of the growth of BSG's microbial population during each step of the processing in order to determinate the critical operations parameters. Preliminary results from the developed approach in this collaboration indicates that ready-to-eat food products from BSG can be safely processed. In 2024-2025, a scale-up of the critical operations of the process will be achieved in the [pilot plants](#) of the St-Hyacinthe Research and Development Centre prior to the transfer to the industry level.

Information on the collaboration between St-Hyacinthe Research and Development Centre of Agriculture & Agri-Food Canada (AAFC) and the Collaboration Initiative can be found in chapter 3.3.1.

³ The following section was written by Dr Sébastien Villeneuve from Saint-Hyacinthe Research and Development Centre in Quebec, Canada.

3.1.6.2 Value-added Meat Co-products and Food Waste Reduction Laboratory⁴

In this section, a new partner of the Collaboration Initiative introduces himself and his ongoing work in Canada as part of the Agriculture & Agri-Food Canada (AAFC):

The issue of food loss and waste (FLW) is multifactorial and as such, the strategies to address this complex issue must span wide range disciplines, expertise, and international perspectives. This is because the point of occurrence and the severity of FLW along the food value chain may vary from one jurisdiction to another. Needless to say, there is no silver bullet in our efforts to tackle this issue.

On the hierarchy of solutions to address the issue of food loss and waste, reducing from the source is primary, followed by recovering for food and feed and then, recycling for alternative utilizations. In my laboratory at the Lacombe Research and Development Centre, Agriculture and Agri-Food Canada, I deploy innovative approaches along this spectrum of strategies to reduce and find utilization for food waste along the food value chain. The research works we do to tackle this FLW challenge include:

- Production of intelligent and active biodegradable packaging from food/meat industry secondary streams
- Circular economy in the protein industry: exploring the potential of animal by-products in insect production for food and feed
- Optimizing the traditional and novel processing technologies for protein extraction and isolation from meat secondary streams
- Exploring the value-added potential in spent hen and animal by-products through thermal hydrolysis

These current research works are done in collaboration with researchers across a wide range of disciplines and I am constantly seeking opportunities to work with experts across the globe to address this daunting issue of food loss and waste to meet the United Nations SDG target 12.3. In this attempt, I have visited the Thünen Institute of Market Analysis on 17th October, 2023 (Figure 17) where I had the opportunity to meet with Dr Felicitas Schneider, Dr Martin Banse and Mr Stefan Lange to discuss potential prospects for future collaboration.



Figure 17 Dr Philip Soladoye (center) from Lacombe Research and Development Centre at Agriculture and Agri-Food Canada at his visit at Thünen with Felicitas (left) and Stefan Lange (right) (credit: Philip Soladoye)

⁴ This section was provided by Dr Philip Soladoye from Lacombe Research and Development Centre at Agriculture and Agri-Food Canada.

Also, I am currently the Guest Editor for a Special Issue on "[Sustainable Strategies for Food Waste Utilization](#)" in the Sustainability journal. In this Special Issue, it is my intention to be able to compile comprehensive innovative and sustainable strategies across the globe in our effort to address the issue of FLW.

3.1.7 Update on FLW activities in Ecuador⁵

The initiative called Gestión Integrada de Sistemas Alimentarios (Integrated Food Systems Management) (GISA) developed by a group of researchers from the Escuela Politécnica Nacional (National Polytechnic School) (EPN) of Ecuador, has contributed to research on food loss and waste (FLW) in the Metropolitan District of Quito. This contribution has been made through research projects, as well as doctoral, master's, and undergraduate theses. All these research projects are part of the Doctoral Program in Technological Management, the Master's Program in Science and Technology Management, and Production Engineering of the Faculty of Business Administration at EPN.

In 2019, a thesis titled "[Analysis of the impact of losses of fruits and vegetables in biophysical terms](#)" (in Spanish with English abstract) was conducted, taking the Mercado Mayorista (Wholesale Market) of Quito as a case study. This market serves as the distribution and supply centre for fresh food to the retail markets in the city.

From 2019 to 2023, during a doctoral research period, information was collected in households in the Metropolitan District of Quito to quantify and determine the reasons for food waste, as well as the environmental pressures in terms of energy, water, and soil caused by food waste in the city. The [first publication](#) quantifies waste and reveals these environmental pressures. It also presents an analysis of some initiatives to reduce food waste and public policies applied to the rice and potato supply chain. The [second publication](#) quantifies food waste in Quito households anew and characterizes the metabolism of urban solid waste management in the city, estimating its contribution to greenhouse gas emissions. A third publication is in progress and aims to reveal the reasons for food waste and characterize urban solid waste.

From 2019 to 2022, the Water-Energy-Food Nexus (WEF Nexus) Analysis project was developed within the framework of social metabolism as a contribution to the Sustainable Development Goals (SDGs) in Ecuador. This project (Figure 18) gathered information on food loss in three municipal markets in the city of Quito (Santa Clara (Figure 19), La Carolina (Figure 20 **Fehler! Verweisquelle konnte nicht gefunden werden.**), La Magdalena). The collected information served as the basis for a master's thesis that seeks to answer the research question: What is the impact of food loss in Municipal Markets of the Metropolitan District of Quito, in Nexus terms, through the quantification of the use of water, energy, and soil resources.

⁵ This section was provided by Oswaldo Viteri Salazar, Xavier Oña Serrano, Lucía Toledo, Amanda Cañar, and Adrián Benavides (Integrated Food Systems Management Initiative) and Alicia Guevara (Quito Food Bank) from National Polytechnic School (EPN) in Ecuador.



Figure 18 Selected Markets in the Metropolitan District of Quito for Data Gathering (credit: GISA)



Figure 19 Food Waste Classification in the Santa Clara Market (credit: GISA)



Figure 20 Promotion of the Research Project (left) and Food Waste Classification (right) in the La Carolina Market (credit: GISA)

In 2023, four undergraduate theses were conducted by students of the Production Engineering Program. The first thesis determines food loss in the Cotacollao municipal market in the Metropolitan District of Quito. The three remaining works focus on i) quantifying food waste, ii) exploring associations between sociodemographic variables and food waste, and iii) characterizing urban solid waste in the Rumiñahui canton of the Pichincha province of Ecuador. The results of these research projects are under construction for future publication.

On the other hand, another important initiative of the Escuela Politécnica Nacional to prevent FLW is the Quito Food Bank (BAQ). This Food Bank has been operating for over 20 years in the Metropolitan District of Quito, undertaking concrete actions to alleviate hunger in the city. The BAQ collects and selects donated food that is in optimal conditions but has reached the end of the commercial cycle and is typically wasted from various sources, including food-producing or marketing companies, supermarkets, wholesale distribution centers, and the agricultural sector. These products are recovered with the help of volunteers and distributed to vulnerable populations. This comprehensive management model to prevent FLW has allowed the recovery of over 27 million food servings to date, distributed monthly to more than 80,000 people with limited resources.

3.1.8 Update on FLW activities in Germany

3.1.8.1 German National Strategy for Food Waste Reduction

The [German National Strategy for Food Waste Reduction](#) has been in place since 2019. In 2023, there were some interesting updates achieved:

- (1) The private household's platform initiated a Citizen science approach in 2022 where household's food waste data were collected, associated by a range of actions such as workshops and trainings, social media, educational materials, Apps and email-newsletters. In 2023, the data were assessed and discussed at the final meeting in June. The results showed that selected actions had significant effects on the reduction of total food waste by 19 % and of avoidable food waste by 42 % on average, most likely due to better planning of shopping and better storing, handling and cooking practices. The result was used to suggest a redesigned approach for 2024. More information can be found on the [website](#) of the strategy (in German only).
- (2) In 2022, a [Centre of Excellence for Food Service To Reduce Food Waste](#) (CoE) was established to accompany e.g. restaurants and canteens on their way to reduce food waste and to collect FW monitoring data. In this centre, Thünen Institute is engaged in cooperation with our partner United Against Waste e.V. The preliminary results show that as of December 4th 2023, a total number of 31 food

service companies with a total of 224 operating sites participated in the voluntary agreement. Out of those, 39 operating sites successfully implemented the obligatory and optional prevention measures. Their evaluation shows that those 39 companies have been able to reduce a total of almost nine tonnes of food waste within four weeks during their second measurement period in comparison to the first one. Further companies are in the process of being evaluated, updated information is available at the project website in [English](#).

- (3) The [final approval of the voluntary agreement](#) (VA) involving German Retail and Wholesale enterprises as well as the responsible German Ministry of Food and Agriculture was achieved in June 2023. Within this VA each enterprise committed to the SDG 12.3 and to implement reduction measures and also a monitoring system based on depreciations. The Thünen Institute is responsible for evaluating the implementation of this agreement. To do this, the companies annually use a template to provide the Thünen Institute information regarding the implemented measures. In addition, the companies provide the Thünen Institute data on sales losses (write-off rates), food donations and the distribution of food as animal feed. More information on that implementation of a voluntary agreement can be found at the [project website](#).

Thünen Reports and publications following the previous work related to the National Strategy can be found in section 3.6.

Since the awareness-raising campaign “Too good for the bin” has been implemented in Germany in 2012, a lot of different activities were coordinated and offered by the German Ministry of Food and Agriculture. In 2023, the campaign was analysed and discussed with experts in the field and the findings will be implemented into the campaign within the next months.

3.1.8.2 PhD project on interface primary production and retail

The four-year [PhD project](#) at Thünen Institute was successfully finalised in 2023. The aim of the PhD project supervised by Prof Dr Martin Banse, Dr Thomas Schmidt and our coordinator Felicitas from Thünen side was to analyse how interactions between supply chain actors lead to food losses in the upstream supply chain between primary production and retail and how these losses can be reduced. In cooperation with the University of Tuscia (see also chapter 3.3.5), our PhD student Ronja Herzberg spent some weeks in Italy and discussed her experiences with our distinguished colleagues at the University of Tuscia as well as the University of Bologna (Figure 21). The fruitful scientific exchange resulted in a [joint paper](#) dealing with quality standards and contractual terms affecting food losses at Producer Organisations in Italy and Germany. The [second PhD publication](#) related to a [project](#) with a German retailing company on food loss in fruit and vegetables due to private sector quality standards was released in the September issue of the Journal of Cleaner Production. The [third scientific paper](#) completed the PhD related publications by adding insights on “Policy instruments to reduce food loss prior to retail – Perspectives of fruit and vegetable supply chain actors in Europe”. It was published open access in Waste Management in October 2023. Moreover, the dissertation synthesis titled “[Beyond the Blemishes](#)” was developed to link the three scientific papers and finalize the PhD thesis.

Ronja received special recognition when she was awarded the transformation:young talent award ([trafo:nachwuchspreis](#), in German only) from the Lower Saxony Agricultural Transformation Research Association (Verbunds Transformationsforschung agrar Niedersachsen, trafo:agrar) in July 2023. We congratulate Ronja on successfully completing her doctoral studies and wish her all the best for the future!



Figure 21 Thünen PhD student Ronja Herzberg (center) with Tuscia PhD student Roberta Pietrangeli (left), her supervisor Dr Clara Cicatiello (University of Tuscia, second left), Dr Claudia Giordano (then University of Bologna, second right) and Dr Gianluca di Fiore (University of Bologna, right) (credit: Ronja Herzberg)

3.1.8.3 Activities of the German Consumer Advice Centers⁶

The German Consumer Advice Centers (“Verbraucherzentralen”) are consumer organizations and cooperate in a project funded by the Federal Ministry of Food and Agriculture on the topic of food waste and how to prevent it. Through lectures, info stands, and workshops, the Consumer Advice Centers reach many people nationwide. They provide information on the shelf life and correct storage of food, as well as guidelines on how to plan your grocery shopping and meals to reduce food waste at home. In January 2023 they participated in the International Green Week (IWG) in Berlin (Figure 22). Utilising an interactive, magnetic refrigerator, they were able to collect tips to avoid food waste. Several thousand visitors gained new knowledge about the storage and shelf life of food. Another highlight of the year was the annual week against food waste in autumn, where the Consumer Advice Centers informed and raised awareness among thousands of people.

Their work is supported by nationwide market checks, where specific areas related to the prevention of food waste in retail markets are examined. In 2023, they conducted a [sample study](#) of the fruit and vegetable sections in 25 retail markets, noting whether only Class I or also Class II products were offered and whether certain types of vegetables were sold by weight or exclusively by piece. The current results show that markets still mainly offer Class I apples and carrots, focusing on features such as appearance or shape. Compared to the [2021 sample](#), the availability of Class II apples and carrots has only slightly increased. Discounters offered the least of Class II apples and carrots. In contrast, organic markets exclusively offered Class II apples and carrots. This picture has not changed compared to the previous survey.

Offering fruits and vegetables in different sizes increases the choice for consumers and allows them to shop according to their needs. The market check in 2023 revealed that kohlrabi and iceberg lettuce were sold exclusively at a uniform unit price, regardless of size and mass. This may tempt consumers to choose larger pieces without considering their actual needs, leaving smaller ones possibly unsold.

⁶ This section was provided by Ms Annett Reinke from Verbraucherzentrale Brandenburg e.V. as well as Ms Bethel Yonas und Ms Sonja Pannenbecker from Verbraucherzentrale Bremen.



Figure 22 German Consumer Advice Centers in action at International Green Week in Berlin (credit: Verbraucherzentralen e.V.)

To place the topic with relevant stakeholders, the Consumer Advice Centers utilized committees, advisory boards, statements on legislative initiatives, and professional exchanges. In the fall of 2023, for example, the Federal Association of the Consumer Advice Centers represented the topic during a hearing in the Committee on Food and Agriculture of the Bundestag and published a statement. One of the demands of the Consumer Advice Centers is, among other things, that industry-specific food waste reduction targets should be binding. Achieving reduction goals must also be verifiable and closely monitored. Within a monitoring framework, uniform methods for data collection on food waste should be defined throughout the entire value chain.

The 2023 cooperation with the Collaboration Initiative is mentioned in section 3.2.4.

3.1.8.4 Food Council Braunschweig and Braunschweig region

As reported in our [2022 annual report](#) (chapter 3.1.7), the Collaboration Initiative co-funded the **Food Council Braunschweig and Braunschweiger Land** (so-called ERBSL) in November 2022. The aim is to make food supply in the Braunschweig region more sustainable and socially just. The ERBSL is open for all citizens living in the Braunschweig region and financially supported by the City of Braunschweig. The different working groups of ERBSL were very active in 2023 by supporting other local food related initiatives, participating in selected decision-making committees of the city and organising awareness raising events towards food and nutrition. In November 2023, the first birthday of the ERBSL was celebrated in a public event where a summary of already achieved tasks and an outlook on next steps was provided.

In order to facilitate the better cooperation of all 60 existing food councils in Germany, ERBSL also supported the founding of the nationwide network of Food Councils in March 2023. The aim is also to have a better connection to other food councils active in the neighbouring countries Austria, Italy, Luxembourg, Netherlands and Switzerland. Another achievement was the first **Good Food Festival** organised under the umbrella of the ERBSL and connecting various food related initiatives across Braunschweig region in 15 events in September 2023. The type of events varied from workshops how to build a raised bed for your garden, sharing cooking recipes for vegan spread, enjoying a fair dinner cooked only from fair traded ingredients, a guided tour to an organic farm or guided bicycle tours to unharvested public fruit trees. Of course, also a snip party was part of the Good Food Festival (see chapter 3.2.1). More information on the ERBSL can be found [here](#) (in German only).

The **ERBSL working group Food Waste** conducted a series of activities in 2023 as well. It is chaired by our coordinator Felicitas. We connected the community college which provides free cooking courses related to food preservation techniques applied for rescued food with a new instructor, co-organised two snip parties and supported other Good Food Festival events, started into valuable discussion with the City of Braunschweig how to implement food waste prevention into their climate protection program, provided awareness raising at a climate concert and learned how to preserve bread dumplings made from rescued bread (Figure 23). Our next

steps will include a mapping of organisations, businesses and initiatives dealing with processing surplus food or redistribution of surplus food in the region. In addition, we would like to provide public discussion events on selected food loss and waste topics.



Figure 23 Rescued bread dumpling dough (left), joint cooking of the bread dumplings by working group members (right) (credit: Felicitas Schneider)

As in the recent years, we co-organised a **World Disco Soup Day** on April 29th, 2023 in the city centre of Braunschweig. foodsharing Braunschweig contributed with wonky and surplus fruits, vegetables as well as bread from different local retailers and bakeries. Activists from Transition Town Braunschweig, Slow Food Braunschweiger Land, Futter Teresa, community supported agricultures SoLaWi Dahlum and SoLaWi Landwandel as well as from our Thünen FLW team cooperated under the umbrella of ERBSL. We supported interested citizens with the processing of a two-course menu and provided background information on the topic on the way (Figure 24). Different types of vegan soups and a delicious fruit salad served as desert were offered free of charge.



Figure 24 Soup made from rescued surplus ingredients at our World Disco Soup Day in Braunschweig (left, credit: Felicitas Schneider), booth staffed with Anika and Felicitas from the Thünen FLW team (right, credit: Janine Pelikan).

3.1.8.5 Global Forum of Food and Agriculture 2023 and 2024

The Global Forum for Food and Agriculture (GFFA) is an international conference related to global agricultural and food policies. Hosted by the Federal Ministry of Food and Agriculture (BMEL) in cooperation with the Berlin Senate and Messe Berlin GmbH it is held in Berlin on an annual basis. In previous years, high-level guests from

international organisations and politicians contributed to the event as speakers. GFFA is also the event where the world's largest informal conference of Agriculture Ministers take place. In 2023, about 70 agriculture ministers and high-level representatives from international organisations, such as the Food and Agriculture Organisation (FAO), the Organisation for Economic Co-operation and Development (OECD), World Trade Organisation (WTO) and World Bank attended that conference.

Besides other parts, interested parties are invited to apply for organising Expert Panels as well as contribute to the Innovation Forum exhibition. Especially young scientists are called to introduce their field of research in the GFFA Science Slam.

In 2023, our young Thünen colleague **Ms Lia Orr won the GFFA Science Slam** with her outstanding presentation on "Food for Thought - The childhood dream of an apple and how the scientist helped". The poem tells the story of Mr Apple and his contribution to food waste reduction at the level of retail. She had to compete with four scientists from Italy, Lebanon, India, and South Africa in her ten-minute presentation. Finally, she was [awarded](#) by German Minister of Agriculture, Mr Cem Özdemir. Congratulations, Lia!

The Global Forum of Food and Agriculture 2024 will take place from January 18 to 20th, 2024 in Berlin. The topic is "[Food Systems for our future – Joining forces for a Zero Hunger World](#)" which is structured into four main pillars. Food Loss and Waste Prevention is one of those subtopics in 2024. The Collaboration Initiative organises the **Expert panel** "[From global strategies to local implementation of food loss and food waste prevention](#)" together with its partners Brazilian Agricultural Research Corporation (Embrapa), thinkstep-anz and Global Research Alliance on Agricultural Greenhouse gases (GRA) on January 19th, 2024 from 9:30 to 11:00 am. We will provide insights how to connect high-level policy and on the ground practice involving multiple actors within an interdisciplinary and cross-cutting challenge like FLW prevention. Our examples will cover Australia, Brazil, Germany, New Zealand and Zimbabwe. Furthermore, our coordinator Felicitas will also participate in the **Expert Panel** "[From farm to food donation. How to maximise the potential of preventing harvest losses to ensure food security?](#)" organised by European Food Banks Federation. All expert panels are broadcasted on the [website](#)⁷.

In addition to the expert panels mentioned above, the Collaboration Initiative FLW also invited a number of cooperation partners to present their FLW prevention activities at the **Innovation Forum booth no 15**. The booth will be available on January 18 and 19, 2024 on level 1. We are very excited about the great programme we will present together with our international colleagues. The activities will cover the whole food supply chain, innovations and knowledge from 12 countries and all continents. Visitors will learn about hermetic and non-hermetic grain storage (see also chapter 3.3.2), by-catch reducing fishing gear, persimmon harvest losses (see also chapter 3.3.3.1), retailers' quality standards, social innovations tested by LOWINFOOD project (see also chapter 3.3.5), urban circular food systems (see also chapter 3.1.5), redistribution of surplus food, food waste from street markets (see also chapter 3.3.6), voluntary agreements with wholesalers and retailers as well as food service sector. You are very welcome to join us and see our videos, experience storage pests up close, listen to storage pests eating habits and try out the plate waste tracker!

3.1.9 Update on FLW activities in Spain⁸

Parallel to their cooperation with our Initiative (see chapter 3.3.3), there are also further valuable national activities to reduce food loss and waste conducted by our Spanish partners. The following section provides a brief insight on selected actions. In the Valencian Community, a Spanish Mediterranean region, different activities are being carried out to increase the prevention and reduction of food waste, thanks to an Action Plan promoted by

⁷ The web stream might only be accessible after prior [registration](#) which is free of charge.

⁸ The text and the figures were provided by Dr Héctor Barco Cobalea from Enraíza Derechos, Dr Maria-Angeles Fernandez-Zamudio from Valencian Institute of Agricultural Research (IVIA) and Dr Tatiana Pina from University of Valencia.

the regional government. This Plan has been in operation since 2019, and its efforts are being coordinated by Dr Maria-Angeles Fernandez-Zamudio from the Valencian Institute for Agricultural Research (IVIA). Initiatives are taking place in different settings, involving various stakeholders of Valencian society in general, and of the food chain in particular.

A summary of the varied number of activities undertaken has been compiled in the dissemination publication "Working for a future with 'zero' food waste" (February 2023) which is available [online](#) (in Spanish).

The main activities carried out in 2023 are highlighted as follows:

3.1.9.1 Work with collective catering (HoReCa Channel)

In 2022, a pilot study was initiated at the Convention Centre of Valencia as a collaboration promoted by the World Sustainable Urban Food Centre of Valencia (CEMAS). The activities are being carried out by a multidisciplinary team from the University of Valencia (UV), including Dr Jose Miguel Soriano and Dr Nadia San-Onofre (Food & Health Lab, Institute of Materials Science-UV), PhD student Inma Zarzo (University Clinic of Nutrition, Physical Activity and Physiotherapy, Lluís Alcanyís (Foundation-UV), Dr Tatiana Pina (Department of Experimental and Social Sciences Education, UV), and Dr Maria-Angeles Fernandez-Zamudio (IVIA).

During 2023, food waste generated at five major congresses has been measured, and interesting conclusions have already been drawn. The first step was to establish a measurement protocol, adapting the one proposed by Monash University (Cook et al., 2020) to MICE (Meetings, Incentives, Conventions, and Exhibitions) tourism, a sector for which there are currently no data in scientific literature. The summary of the measurement protocol is shown in Figure 25.



Figure 25 Protocol followed to quantify food waste at the Valencia Conference Centre based on the work of Cook et al. (2020), DOI: 10.1111/jhn.12928. Designed by: T. Pina.

A comprehensive analysis has also been conducted on the role played by various stakeholders involved in the preparation, service, and consumption of food at events organized at the Valencia Conference Centre. Their attitudes and actions have an impact on the potential generation of waste. A summary of this diagnosis is presented in Figure 26.

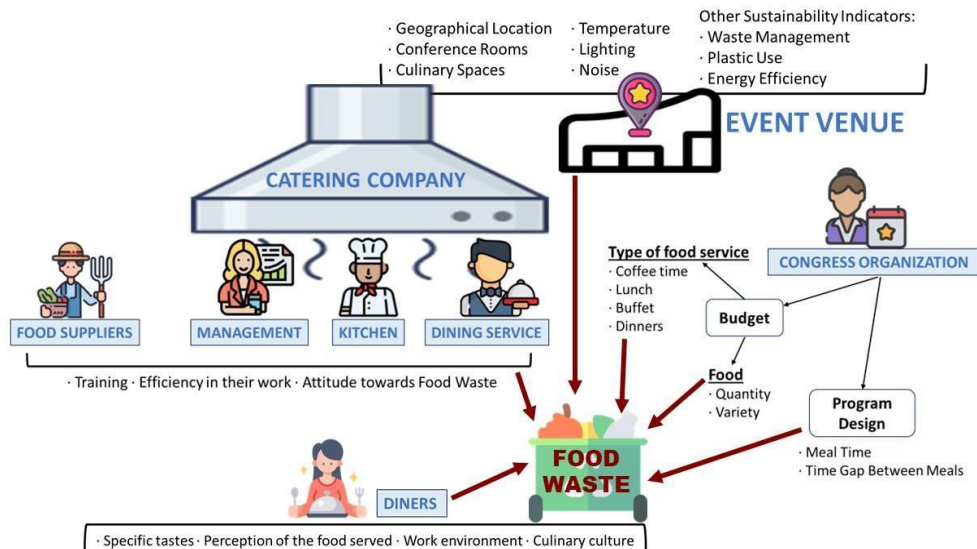


Figure 26 Key Factors in the Valencia Conference Centre impacting Food Waste. Designed by M.A. Fernández-Zamudio.

To date, data has already been analysed by pooling information from the first three congresses, where all participants at these events work in the field of health. A total of 1020 diners attended, consuming 38 different dishes. The project encompassed two main objectives, the first being to promote the quantification of food waste (Figure 27). In the first three congresses alone, 104.4 kilograms of food were discarded. Between congresses, both the total volume of food served per portion and the type of food on the menu changed, leading to inevitable differences. Waste per person ranged from 87.6 g (Event-3) to 123.9 g (Event-2), while the percentage of discarded servings varied between 5 % (Event-1) and 27.2 % (Event-2).

The second objective was to analyse the nutritional composition of the wasted food. This was done by first classifying the food waste into the food groups outlined in the EAT-Lancet Planetary Health Diet and then calculating the energy-nutritional value of the food waste generated at each congress. A preliminary estimate suggested that, considering the reference dietary intakes, these residues could meet the dietary reference intakes for 150 people/day in terms of energy. Not only is the volume of wasted food significant, but the nutritional impacts resulting from discarding such food are also crucial. These figures will raise awareness among those preparing and serving food, as they serve as indicators motivating increased attention to the cooking process. Food needs to be tasty, and the portion size and type of service needs to be well adapted to the customer, as this will facilitate waste prevention.



Figure 27. Team conducting the food waste measurement at the canteen (source: M.A. Fernández-Zamudio).

This project was presented at the event organized by CEMAS on October 3, 2023, as a High-Level Meeting for the Prevention of Food Waste, within the roundtable dedicated to Research and University (Figure 28). Other news about this event can be found [here](#).



Figure 28. Advertisement of the CEMAS event in Valencia (Spain), left; Photo from the case study session Research & Universities at that event (source: Tatiana Pina).

3.1.9.2 Work with the School Community

There are various projects driven by Dr Tatiana Pina and Dr Maria Calero (Department of Experimental and Social Sciences Education, University of Valencia) with teacher training students (future pre-school and primary school teachers). Different educational resources related to food waste have been developed following the Service-Learning methodology, through which knowledge and competencies are acquired as curricular projects are implemented at schools. This has directly involved a group of teachers and students who were made sensitive to the problem of food waste, and who subsequently became engaged in a campaign to raise awareness among the rest of the educational community and families. As confirmed through different questionnaires, the activities carried out on Food Waste have helped future teachers to better understand this socio-environmental problem, as well as the need to take measures to contribute to its reduction. Some of [these results](#) have been presented at the 15th Conference of the European Science Education Research Association (ESERA 2023) (Cappadocia, Turkey) and at the Food, University and Territory Workshop (University of Valencia) (in Spanish).

Furthermore, on December 18, 2023, a workshop on food waste was organized for primary and secondary school teachers and the management staff (Figure 29). The objective is to involve the school community, raising awareness, for the gradual integration of food waste topics into the academic curriculum. In 2022, the [Espigoladors Foundation](#) was requested to draw up a guide to assist in implementing food waste prevention plans in school canteens. This guide was presented during this session.



Figure 29. Advertisement for the workshop on food waste was organized for primary and secondary school teachers and the management staff (source: M.A. Fernández-Zamudio).

3.2 Topic 2: Awareness Raising & Capacity Building

3.2.1 International Day of Awareness of Food Loss and Waste

We at the Collaboration Initiative are very proud that we were able to support this great idea from the very beginning in 2018 under the G20 presidency of Argentina (see our [Annual Report 2020](#)). Since 2020 when the day was introduced, the 29th of September is celebrated by several global organisations, research institutes and stakeholders dealing with FLW prevention. As in the previous years, in 2023 we also implemented one local Day of Action in cooperation with other organisations as well as an online presentation of research results related to our ongoing projects open for public.

Braunschweig is the headquarter of the Thünen Institute and represents a medium size German city of approximately 250,000 inhabitants in Lower Saxony. In 2023, we collaborated with the Food Council (ERBSL) for a snip party to raise awareness of the general public on September 30th. This year the event took place right next to the Braunschweig Cathedral in the city centre. As in the previous years, other local food-related initiatives like foodsharing Braunschweig and Transition Town Braunschweig also contributed to the event. Framework of the snip event was the so-called Good Food Festival which was the umbrella for 15 events addressing various topics related to nutrition, health, fair trade and food sourcing in September 2023. The Good Food Festival was organised by the Food Council Braunschweig and Braunschweig region for the first time. Parallel to this, the official Action Week “Germany saves Food” was coordinated by the German Ministry of Food and Agriculture from September 29th to October 6th, 2023.

As the Thünen Institute and the Collaboration Initiative Food Loss and Waste, we provided insights into our research results by offering posters and an interactive online memory, practical tests and quizzes suitable for different age groups (Figure 30).



Figure 30 Part of the rescued food before cooking (left), participants joining for snipping the rescued food for soup and salad (right) (credit: Felicitas Schneider)

In 2022, the Thünen Institute started a new online format, the [Thünen-Kolloquium](#), to get into closer contact with the general public. Every first Thursday of each month, there is an online presentation related to selected topics of Thünen research results. Dates and topics are promoted in advance and beside Thünen staff members, interested public is also welcome to join the presentation and following discussion. On October 5th, in the presentation “**How Germany reduces Food Waste**” Ms Manuela Kuntscher offered results from previous and ongoing projects related to the implementation of the German National Food Waste Prevention Strategy (see also chapter 3.1.8.13.1.8). Finally, we reached about 85 colleagues as well as interested persons from outside Thünen and had a fruitful discussion. The slides of the presentation are available [here](#) in German.

Another awareness campaign was co-organised in April 2023 which is summarised in the German country update in chapter 3.1.8.

3.2.2 Cooperation with the Chinese Academy of Agricultural Sciences

This cooperation was formally started with a Memorandum of Understanding in 2017 and continued further as reported in our previous Annual Reports. At present, joint publications are on their way. Unfortunately, the joint applications related to a fellowship funded by Alexander von Humboldt Foundation (see [2022 report](#)) were not successful in 2023. We will go ahead with other ideas!

3.2.3 Cooperation with the National Metrology Institute (Physikalisch-Technische Bundesanstalt) Germany⁹

The working group International Cooperation group of the Physikalisch-Technische Bundesanstalt (PTB) with financing from the Federal Ministry for Economic Cooperation and Development (BMZ) and the European Union supports developing and emerging countries in the development and use of needs-based, internationally recognised quality infrastructure. A functioning quality infrastructure is indispensable as it enhances, amongst others, free, fair, and secure trade; human and environmental health; as well as energy transition.

Moisture content especially of grain products is an indispensable quality parameter that influences storage, and possible waste/loss of grains. A functioning quality infrastructure system is integral in minimising food loss and waste as is reliable measurements of moisture content of grain crops. The PTB upon request of partner institutions, organised a blended learning online training series on Measurement Uncertainty for Grain Moisture Determination aimed at improving reliability and comparability of grain moisture measurements as well as support partner metrology institutions in achieving traceability of their measurements



Figure 31 Measurement of moisture content (credit: PTB).

In attendance were 25 participants from 16 Asian, American and African countries. The participants got insights into measurement uncertainty estimation for grain moisture measurements, a demonstration of a grain moisture

⁹ This section was provided by Ukeme Okon-Archibong, Regina Kluess, Lisa Kuehle and Jana Körner from National Metrology Institute (Physikalisch-Technische Bundesanstalt, PTB) in Germany.

reference method and the identification of possible influence factors for measurement uncertainty. Thanks to the collaboration with Thünen Institute, the participants in a lecture with Dr Felicitas Schneider gained comprehensive understanding of reliable grain moisture measurements within the context of food loss and waste.

The evaluations especially with regard to the relevance of the course for the participants' work were all round positive, so much so that the course content will be made available on the PTB platform "Digital Learning Material" for internal reference and will likely be made widely available on the PTB E-learning platform in the future. Similar courses based on experiences from this amongst other courses, are in the works in the Asia Pacific region.

3.2.4 Cooperation with the German Consumer Advice Centers¹⁰

In a project funded by the Federal Ministry for Economic Affairs and Climate Action, the Consumer Organization Bremen, in collaboration with the Bremen Evangelical Church, was able to reduce food waste in five day-care centers. The project is called "[Bremer Kitas reduzieren Lebensmittelverluste](#)" (in German only). Food waste measurements were conducted, and with advisory support, measures to reduce waste were implemented in collaboration with each kitchen management. Overall, food waste was reduced by 26 percent, and the goal is to integrate the new knowledge into everyday work in a sustainable and long-term manner, as well as convince more facilities to measure their food waste and take measures to reduce them. The final event in October 2023 included an exciting contribution from Felicitas Schneider from the Thünen Institute on global food waste (Figure 32), Philipp Stierand from [Kantine Zukunft](#) (Canteen future, in German), Berlin, and Maike Schindwein from [Kompenzzentrum Außer Haus-Verpflegung](#) (Competence Center Out-of-home consumption, in German). Everyone accompanied and supported the project throughout its entire duration.



Figure 32 Felicitas connects global with local food waste (left), Bethel Yonas illustrates the project results (right) (credit: Verbraucherzentrale Bremen e.V.)

¹⁰ This section was provided by Ms Annett Reinke from Verbraucherzentrale Brandenburg e.V. as well as Ms Bethel Yonas und Ms Sonja Pannenbecker from Verbraucherzentrale Bremen.

3.2.5 Cooperation with the University Centre of the Westfjords (Iceland)

The University Centre of the Westfjords located in Iceland offers a master's program in “Coastal Communities and Regional Development”. By continuing her previous teaching activities, our coordinator Felicitas facilitates the course “Sustainable Waste Management in Coastal Communities” annually since the summer term 2021. Her waste management experiences from former job position allow her to offer the basics of general waste management focused on coastal regions as background information for a more detailed look into FLW generation, prevention and potential waste management options, circular economy and sustainable systems embedded in a global framework. The two-week course is accompanied by excursions and guest speakers from local waste management, private coastal clean-up initiative as well as local harbour authority. In 2023, the students from Canada, Finland, Spain, Sweden, Switzerland, and the United States enriched the provided mix of theory and implemented practice with their own waste management experiences. The visited excursion venues included the sorting facility of the local waste management company contracted by the region as well as the local waste collection centre where the household biowaste collection and treatment is conducted.

3.3 Topic 3: Stimulating research cooperation

3.3.1 Project cooperation with Canada¹¹ - A New Management-driven Initiative on FLW launched by the Science and Technology Branch of Agriculture and Agri-Food Canada

On November 15, 2022, the world's population reached 8 billion people. Scientists predict that the population will be around 10 billion by 2050. Population growth has economic consequences, as well as an impact on the environment and on nutritional intake through the reduction of available foods or the reduction of nutrients in agricultural products themselves. A few Canadian stakeholders, including businesses, multinationals and academic institutions, have already suggested or implemented highly targeted circular economy approaches which are not integrated into the Canadian value chain. The validity of these approaches has in most cases yet to be confirmed as there are no tools to quantify the benefits of these approaches in an integrated manner. Consequently, in 2023, a project entitled “Implementation of a technological platform for the simultaneous calculation of indicators of eco-efficiency, food loss and waste, nutritional value, safety and shelf-life resulting from the integration of the Circular Agri-Food Systems concept along the continuum of the Canadian value chain” was launched by the Science and Technology Branch of Agriculture and Agri-Food Canada (AAFC) to address this issue. This project is led by Dr Louis Sasseville, a Scientist who applies techniques drawn from modern physics to the study of food, its journey through the food system, and FLW reduction, and co-led by Dr Sebastien Villeneuve, a Scientist at AAFC and a Professional Engineer with a twenty-year background in the food cold chain. The objective of this project is to implement a reliable technological platform at AAFC to quantify and validate the benefits associated with the implementation of circular economy practices compared with conventional approaches. Specifically, on this technology platform, indicators of eco-efficiency, food loss and waste, nutritional value, food safety, and food shelf life are established throughout the Canadian value chain continuum, and are used as the basis for numerical predictive models needed to develop a decision support tool that will enable sectors and policy makers to make science-based decisions (Figure 33). Dr Felicitas Schneider from Thünen Institute acts as facilitator for this project in order to share the findings that could also be useful for other countries in the MACS-G20 Collaboration Initiative. The core of the project activities is achieved in the [pilot plants](#) of the [Saint-Hyacinthe](#) Research and Development Centre. The pilot plants provide facilities that foster innovation and direct support to the food processing industry. This includes the development of new or improved

¹¹ The following section was written by Dr Sébastien Villeneuve and Dr Louis Sasseville from Saint-Hyacinthe Research and Development Centre in Quebec, Canada.

products, adopting technologies that boost productivity and support for new companies. Key activities of this projects are achieved in three other AAFC Research and Development ([Guelph](#), [Saskatoon](#), [Summerland](#)). In addition to Dr Sasseville and Dr Villeneuve, fifteen AAFC Scientists collaborating in this project: Dr Martin Mondor (St-Hyacinthe); Dr Evelyne Guevremont (St-Hyacinthe); Dr Yves Arcand (St-Hyacinthe); Dr Isabelle Germain (St-Hyacinthe); Dr Marie-Claude Gentès (St-Hyacinthe); Dr Louise Deschênes (St-Hyacinthe); Dr Fadi Ali (St-Hyacinthe); Dr Reza Zareifard (St-Hyacinthe); Dr Akier Assanta Mafu (St-Hyacinthe); Dr Julie Brassard; Dr Rani Ramachandran (St-Hyacinthe); Dr Alain Clément (St-Hyacinthe); Dr Matthew Nosworthy (Guelph); Dr Emma Stephens (Saskatoon); Dr Amritpal Singh (Summerland).

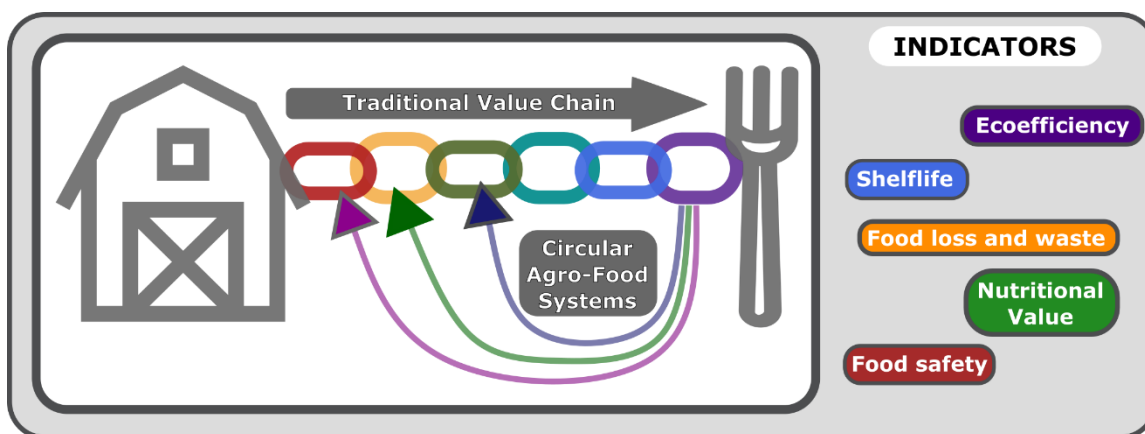


Figure 33 Project’s approach and the five indicators: Traditional Value Chain vs. Circular Agri-Food Systems (credit: AAFC).

3.3.2 Preventing stored product pests in Germany (AVoiD)¹²

Rising annual temperatures increase the infestation pressure in stored products. Hermetic storage, which has been used for many centuries, prevents the migration of stored product pests into the product, and limits the oxygen supply. In the project part on climate-optimized storage (work package 1), various rigid and flexible hermetic grain storage structures are being compared regarding their efficacy in achieving anoxia, stability against damage and penetration (JKI-ÖPV), economic aspects (JKI-SF), maintaining grain quality (MRI), as well as sustainability, and workers safety (TI). A steel container of 6.5 m³ volume has been installed underground (Figure 34) and an above-ground glass fibre silo bin (Figure 35) is built next to it for comparative testing. Flexible structures include silo bags, Grain Pro Cocoons with gas-tight zippers, and various sizes of bags and big-bags. In the lab, we test whether insects are able to penetrate multi-layer plastics and how to achieve maximum oxygen consumption.

¹² The following section was provided by Cornel Adler, Camilla Albrecht, Benjamin Fürstenau, Christina Müller-Blenkle from Julius Kühn-Institute, Berlin, as well as Jovanka Saltzmann and Julia Büchner from Julius Kühn-Institute, Kleinmachnow and completed by Felicitas Schneider.



Figure 34 Stainless steel container with temperature insulation before and after installation under-ground (photos: D. Gräf)



Figure 35 Hermetic glass fiber silo bin for above-ground storage tests (volume 6 m³, photo: C. Adler)

In the AVoiD project part "Early detection" (work package 2), the occurrence and distribution of stored product pest (SPP) insects in Germany are being investigated. To this end, various traps containing attractants (pheromones) were set up inside (Figure 36) and outside storages (Figure 37) on nine farms (three of which were organic farms) in six German federal states in spring 2023. In addition to numerous SPP insects inside the storages, a large number were also caught in the field.



Figure 36 Traps for flying and crawling insects in grain storages (photo: C. Albrecht)

Over the next two years of the project, further farms will be included and the influence of regional/climatic differences on the spread of established pest species and the possible emergence of new ones will be evaluated.



Figure 37 Traps for flying and crawling insects in the field (photo: C. Albrecht)

In the economic sub-project of AVoid, hermetic and non-hermetic storage structures were analysed from a business perspective using a cost-benefit analysis. The process flows and the investment and operating costs of various storage structures were determined in an extensive stakeholder survey. In the next phase of the project, the economic advantages of hermetic and non-hermetic storage structures will be analysed for different climate and loss scenarios.

The economic analysis will be completed by an environmental and social assessment conducted by the Thünen Institute of Market Analysis based on the same scenarios in order to be able to provide further insights on benefits or challenges of the different storage options on those indicators.

3.3.3 Research cooperation with Spain

For further activities related to FLW in Spain see also chapter 3.1.9 in the present report.

3.3.3.1 Measuring Persimmon harvest losses¹³

The collaboration of Dr Maria-Angeles Fernandez-Zamudio from IVIA continues with Dr Felicitas Schneider (Thünen Institute) and Dr Héctor Barco (Espigoladors Foundation) on advancing the diagnosis of harvest losses (see also the Annual report [2020](#) and [2021](#)). Special focus remains on persimmons, a widely cultivated crop of great economic relevance to the Valencian region. A meeting with Dr. Schneider took place on October 2nd in Valencia, advancing joint efforts with two main objectives: 1) To study how to measure harvest losses in fruit trees. Two different sampling methodologies were tested over three campaigns, covering farms managed by different producer cooperatives responsible for organizing the harvest (Figure 38). Harvest loss figures are around 6 tons/ha in a typical year but can exceed 11 tons/ha, as measured in this anomalous year of 2023, marked by aesthetic fruit quality issues due to drought, hail, or deformed fruits; 2) To analyze the economic impacts of harvest losses, which is being confirmed by detailed production costs and all the inputs and resources needed for the harvest, determining the inputs used in vain.



Figure 38 Persimmon food losses photos (credit: MA. Fernandez-Zamudio).

3.3.3.2 Cooperation within European project FOLOU¹⁴

Felicitas Schneider is going to be part of the external review team for both the Manual for Quantification of Food Losses and the Definitional Framework of Food Losses, part of the European project [FOLOU](#). This project aims to include these flows in the monitoring and reduction processes of the European Union, which have been excluded so far, mainly because any food product not harvested is considered outside the concept of "food."

¹³ The chapter was provided by Dr Maria-Angeles Fernandez-Zamudio from Valencian Institute of Agricultural Research (IVIA).

¹⁴ The chapter was provided by Dr Héctor Barco Cobalea from Enraíza Derechos.

3.3.4 CEMAS and EUFIC High-level event on Food Loss and Waste in Valencia

The València World Centre for Sustainable Urban Food, CEMAS, was established in October 2016 in cooperation of the City of València and Food and Agriculture Organisation. On October 3rd, 2023, CEMAS organised a high-level conference on food waste together with the European Food Information Council (EUFIC). Under the title “A multi-stakeholder perspective on food loss and waste reduction strategies” the programme offered plenty of interesting inputs and options for discussion and knowledge exchange (see also chapter 3.1.9). Our coordinator Felicitas was invited to contribute to the “Global and European landscape” session with a presentation and act as moderator for one of the afternoon sessions (see also Figure 28). Further information as the programme and the recordings can be found [here](#). We would like to thank the organisers for their kind invitation to join this excellent event!

3.3.5 Research cooperation with University of Tuscia, Italy¹⁵

The University of Tuscia is working on several project and activities related to food loss and waste reduction.

Through a partnership with the Thünen Institute involving the mobility of **PhD students** (see also [2022 annual report](#), chapter 3.3.3), a methodology for measuring food losses in the post-harvest phase of the supply chain was co-designed. This methodology was implemented in the context of a PhD project that focuses on the evaluation of fruit and vegetable losses in the post-harvest phase and foresees the assessment of the quantity and value of food loss flows between harvesting and distribution, with field data collection in Italy. This collaboration also involved a **study focusing the mechanisms, contracts and conditions** in the fruit and vegetable supply chain in the German and Italian context, from the point of view of the Producer Organisations (see also chapter 3.1.8.2). This study was published as a scientific article:

Pietrangeli, R., Herzberg, R., Cicatiello, C., & Schneider, F. (2023). Quality Standards and Contractual Terms Affecting Food Losses: The Perspective of Producer Organisations in Germany and Italy. *Foods*, 12(10), 1984.

The University of Tuscia is also coordinating the [LOWINFOOD H2020 project](#); that has the aim to evaluate a set of innovations against food loss and waste, by testing them in real food supply chains, selected among those particularly affected by the problem. The project started in 2020 and involves 26 partners (research partners, innovators, food chain actors) coming from all over Europe. Dr Felicitas Schneider from Thünen Institute is part of the project with the role of member of the External Advisory Board, thus supporting the implementation of the project.

3.3.6 PhD on food waste in households and street markets in Zimbabwe¹⁶

The PhD project which commenced in October 2022 aims to explore the characteristics and determinants of food waste in households and street markets in Hatcliffe, a low-income urban residential area in Harare, Zimbabwe. In 2023, the main activities of the project were to collect qualitative and quantitative data through a 7-day kitchen diary survey, waste composition analyses (WCA, Figure 39) and face-to-face questionnaire surveys. The data collection was conducted during two seasons: the harvest season (April-June) and the lean season (October-November).

At household level, 103 households completed the kitchen diary survey and participated in the WCA and a total of 400 questionnaire surveys were conducted. The preliminary findings from the WCA indicate that sadza, a thick maize porridge and staple food of the Zimbabwean diet, is the most wasted food item within the surveyed

¹⁵ This section was kindly prepared by Dr Clara Cicatiello and Roberta Pietrangeli from University Tuscia.

¹⁶ This chapter was written by Sharon Yeukai Mada who is currently PhD student at Thünen Institute of Market Analysis.

households. Concurrently, at street market level, food waste generated during one week from approximately 80 stalls was sorted and weighed and 39 vendors participated in the questionnaire surveys. Notably, vegetable waste recorded the highest mass, more than other food groups.

The next phase of the project focuses on comprehensive data analyses to gain insights into the types of food waste and the reasons behind it. Qualitative data encompassing socio-demographic characteristics, household practices and street market dynamics, collected through the questionnaire surveys, are expected to provide explanations of why food waste is occurring in this low-income community. More details and updates on the PhD work can be found [here](#).



Figure 39 Sadza, the staple food, wasted by households (left), preprepared vegetables from the street market (right) (credit: Sharon Yeukai Mada)

3.4 Topic 4: Matching ideas & funding

The Alexander von Humboldt-Foundation announced the call “[International Climate Protection Fellowship](#)” which is dedicated to prospective leaders and postdocs with climate expertise from non-European developing and transition countries who want to implement a 12 to 24-month project in Germany. Application deadline is already **February 1st, 2024**. If you have an idea related to FLW, please do not hesitate to contact us as potential host.

3.5 Topic 5: Fostering cooperation at implementation level

3.5.1 Cooperation with national and international standardisation organisations

The work of the International Organisation for Standardisation subcommittee [ISO/TC 34/SC 20](#) Food Loss and Waste was further developed during 2023. After preparatory work of working group 1 on selected issues, a first face-to-face meeting took place in April 2023 in Copenhagen hosted by Danish Standard. There, further discussions took place and agreements on tricky issues were made. The preliminary results were presented in the third meeting of ISO/TC 34/SC20 which took place back-to-back with the WG1 meeting. In the next step, the feedback from both meetings was included in the draft of the ISO/CD 20001 “Food loss and waste management system — Requirements for the minimization of food loss and waste across the food value chain”. By end of 2023, the committee draft is open for internal consultation by national mirror committees. Comments from that consultation will be discussed during the next in person meeting of the subcommittee which is planned for April 2024 in the UK.



Figure 40 Group photo of subcommittee members attending the meeting in Copenhagen in person (credit: Danish Standard)

In Germany, the official DIN working group serving as a national mirror group is “[NA 057-02-02 AA food safety – management systems](#)”. Here all information from the ISO group is discussed and feedback on behalf of Germany will be transmitted through the German delegation back to ISO. The Collaboration Initiative coordinator, Felicitas, is a member of the DIN mirror group as well as the head of German delegation related to ISO subcommittee.

3.5.2 Cooperation with United Nations Environment Program (UNEP)

In order to facilitate the implementation of the Food Waste Index reporting, the UNEP established four regional working groups on Food Waste: Asia Pacific, West Asia, Africa and Latin America & the Caribbean. Felicitas was invited to support the UNEP Africa Food Waste Working Group and took part in the four online meetings jointly organised by UNEP’s Initiative Global Opportunities for SDGs (GO4SDGs) and Waste and Resource Action Programme (WRAP). The discussions were completed by very informative contributions by selected African countries and organisations.

In addition, our fruitful cooperation with UNEP was also continued in relation to our annual FLW workshop, this time in India. We appreciate the workshop participation of Ms Clementine O’Connor very much as she also provided her valuable network contacts (see also chapter 3.1.3).

3.6 Recent literature from Initiative partners and other sources

In this section, we introduce selected new literature related to FLW which was published by members of our network in alphabetical order. If you would like to see your publication listed here, too, please give us a hint!

Publications:

- Athai J., Kuntscher M., Schmidt T.G. (2023) Lebensmittelabfälle und -verluste in der Primärproduktion und in der Verarbeitung. Braunschweig: Johann Heinrich von Thünen-Institut, 125 p, Thünen Working Paper 209, DOI:10.3220/WP1678867614000, https://literatur.thuenen.de/digbib_extern/dn066143.pdf (in German with english summary).
- Brüggemann N., Orr L. (2023) Stand der Umsetzung der Beteiligungserklärung: Abschlussbericht 2022; Handelsforum RLV, Dialogforum des Groß- und Einzelhandels zur Reduzierung von

- Lebensmittelverschwendung; Zu gut für die Tonne! Wuppertal: Collaborating Centre on Sustainable Consumption and Production, 26 p, https://www.zugutfuerdietonne.de/fileadmin/zgfdt/sectorspezifische_Dialogforen/Gross-und Einzelhandel/Dialogforum_Handel_Abschlussbericht2022.pdf (in German with english summary).
- Fajardo Caizaluisa D.P., Sangacha Robalino E.V. (2020) Analysis of the impact of losses of fruits and vegetables in biophysical terms. Master thesis, National Polytechnic School (EPN), Ecuador, <http://bibdigital.epn.edu.ec/handle/15000/20671>, in Spanish with English abstract.
 - Herzberg R. (2023) Beyond the blemishes: Causes and governance of food loss in upstream fruit and vegetable supply chains. Göttingen: Georg-August-Univ, xi, 121 p, Göttingen, Univ, Fak für Agrarwiss, Diss, 2023, DOI:10.53846/goediss-10174, https://literatur.thuenen.de/digbib_extern/dn067392.pdf.
 - Herzberg R., Schneider F., Banse M. (2023) Policy instruments to reduce food loss prior to retail - Perspectives of fruit and vegetable supply chain actors in Europe. Waste Manag 170:354-365, DOI:10.1016/j.wasman.2023.09.019, https://literatur.thuenen.de/digbib_extern/dn066923.pdf.
 - Herzberg R., Trebbin A., Schneider F. (2023) Product specifications and business practices as food loss drivers - A case study in a retailer's upstream fruit and vegetable supply chains. J Cleaner Prod 417:137940, DOI:10.1016/j.jclepro.2023.137940, https://literatur.thuenen.de/digbib_extern/dn066583.pdf.
 - Kuntscher M., Goossens Y., Athai J., Lehn F., Schmidt T.G. (2023) Food waste and losses in the primary production. Braunschweig: Thünen Institute of Market Analysis, 2 p, Project Brief Thünen Inst 2023/34a, DOI:10.3220/PB1691395231000, https://literatur.thuenen.de/digbib_extern/dn066635.pdf.
 - Kuntscher M., Goossens Y., Athai J., Lehn F., Schmidt T.G. (2023) Food waste and losses in the processing sector. Braunschweig: Thünen Institute of Market Analysis, 2 p, Project Brief Thünen Inst 2023/33a, DOI:10.3220/PB1691394846000, https://literatur.thuenen.de/digbib_extern/dn066634.pdf.
 - Lehn F., Goossens Y., Schmidt T.G. (2023) Economic and environmental assessment of food waste reduction measures - Trialing a time-temperature indicator on salmon in HelloFresh meal boxes. J Cleaner Prod 392:136183, DOI:10.1016/j.jclepro.2023.136183, https://literatur.thuenen.de/digbib_extern/dn066200.pdf.
 - Lehn F., Goossens Y., Kuntscher M. (2023) Nachhaltigkeitsbewertung von Demonstrationsprojekten zur Reduzierung von Lebensmittelverlusten und -abfällen in den Sektoren Primärproduktion und Verarbeitung. Braunschweig: Johann Heinrich von Thünen-Institut, 104 p, Thünen Working Paper 211, DOI:10.3220/WP1682325526000, https://literatur.thuenen.de/digbib_extern/dn066266.pdf (in German with english summary).
 - Lehn F., Schmidt T.G. (2023) Sustainability assessment of food-waste-reduction measures by converting surplus food into processed food products for human consumption. Sustainability 15(1):635, DOI:10.3390/su15010635, https://literatur.thuenen.de/digbib_extern/dn065760.pdf.
 - Oña-Serrano X., Viteri-Salazar O., Cadillo Benalcazar J.J., Buenaño Guerra X., Quelal-Vásconez M.A. (2022) Reducing environmental pressures produced by household food waste: initiatives and policy challenges. Int. J. Environment and Sustainable Development, 1(1):1, DOI: 10.1504/IJESD.2022.10048771.
 - Oña-Serrano X., Viteri-Salazar O., Cadillo Benalcazar J.J., Buenaño Guerra X. (2022) Caracterización de los residuos sólidos urbanos y desperdicios de alimentos del Distrito Metropolitano de Quito (Urban solid waste characterization and food waste of the Metropolitan District of Quito). Revista Iberoamericana Ambiente & Sustentabilidad Vol. 5, 2022, DOI: <https://doi.org/10.46380/rias.v5.e230> (in Spanish with English abstract).
 - Orr L., Schmidt T.G., Lehn F., Heinrich M., Kuntscher M., Brüggemann N., Eisenhauer P. (2023) Dialogue Forum on Wholesale and Retail Trade towards Food Waste Reduction. Braunschweig: Thünen Institute

- of Market Analysis, 2 p, Project Brief Thünen Inst 2023/17a, DOI:10.3220/PB1675254902000, https://literatur.thuenen.de/digbib_extern/dn065995.pdf.
- Orr L., Goossens Y., Heinrich M., Brüggemann N. (2023) Jointly reducing food waste - the experiences of the German discussion forum for wholesale and retail. Sustainability 15(16):12289, DOI:10.3390/su151612289, https://literatur.thuenen.de/digbib_extern/dn066492.pdf.
 - Pietrangeli R., Herzberg R., Cicatiello C., Schneider F. (2023). Quality Standards and Contractual Terms Affecting Food Losses: The Perspective of Producer Organisations in Germany and Italy. Foods, 12(10), 1984, DOI:10.3390/foods12101984.
 - Trebbin A., Herzberg R., Schneider F. (2023) Food loss in European fruit and vegetable supply chains: The impact of retailers' product standards. Braunschweig: Thünen Institute of Market Analysis, 2 p, Project Brief Thünen Inst 2023/04a, DOI:10.3220/PB1672750924000, https://literatur.thuenen.de/digbib_extern/dn065783.pdf.

Selected webinars, podcasts and other recordings:

- The Collaboration Initiative Food Loss and Waste presents the video recordings of its **6th FLW Workshop** conducted on October 5 to 6th, 2022 in Yogyakarta/Indonesia on the [website](#). English subtitles are available. Please go to the 6th Workshop and click on the “agenda and recordings” button where you can find the corresponding video for each session separately, also bookmarks for each presentation are available.
- FAO Regional Office for Europe and Central Asia conducted a series of **Regional Impact Webinar on Food Loss and Waste Reduction** in recent years, including one on packaging in October 2023 and one on households in December 2023. You can find all recordings of the webinars on the [website](#).
- FAO has launched the new **FAO Food Loss App (FLAPP)** on the International Day of Awareness of Food Loss and Waste 2023. The FLAPP is designed to empower farmers, producer associations, cooperatives, and companies to make informed decisions by analysing where and why food losses happen at the farm level. At present, the dynamic FLAPP reports on 10 countries and 7 commodities, will expand its coverage, both in terms of countries and commodities. More information can be found [here](#).
- Heinrich Böll Stiftung Baden-Württemberg released five podcasts with the title **“Ab in die Tonne? Lebensmittelverschwendung in Deutschland”** („Into the bin? Food waste in Germany”) in spring 2023. After an introduction to the topic, Ms Annika Ernst talks to four people who work with different aims on the issue: our coordinator Felicitas mentions the scientific point of view; Ms Katrin Scherer introduces the first foodsharing café in Germany; Mr Udo Engelhardt highlights the work of the food bank in Baden-Württemberg; Mr Ralf Nentwich provides insights from the political party of the Bündnis 90/Die Grünen (green party). The [podcasts](#) are in German but for each part there is also a transcript available which you can easily translate into your favourite language.
- forum.ernährung heute, an Austrian center for nutritional issues, discusses selected topics related to nutrition, health and life style with experts in the course of their **regular webinar f.eh live im Talk**. On November 21th, 2023, Mr Dominic Heizmann from WWF Austria and our coordinator Felicitas discussed with Ms Elisabeth Sperr from f.eh their sights on **“Food Waste: Status quo”** in the 26th part of the series. The recording is in German only.
- **Global Forum of Food and Agriculture 2024** will take place from January 18 to 20th, 2024 in Berlin. We are involved in two expert panels and organise an exhibition booth. You are welcome to visit us online or in person. Further information can be found in chapter 3.1.8.5.



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