

Collaboration Initiative Food Loss and Waste launched at MACS-G20

2021 update on activities



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1 Preface

In 2021, the Collaboration Initiative Food Loss and Waste launched at MACS-G20¹ finished its sixth year. The global pandemic still influences our work and private life to a large extent and global food chains face ongoing challenges. Fighting against food loss and waste continued to be part of global and regional high-level discussions – especially within the United Nations Food Systems Summit and the accompanying independent dialogues as well as UN SDG Action Campaigns. More and more countries and stakeholders are aware of the opportunities provided by fruitful cooperation among different actors along food supply chains and implement policies and take actions. Let's be a part of it!

As in previous years, we - Stefan and Felicitas from Thünen Institute (Federal Research Institute for Rural Areas, Forestry and Fisheries) - invited our partners to contribute with a brief summary not only on our joint but also on their own or ongoing national FLW activities to the present report. 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, Turkey. Germany took leadership of the Initiative and from 2015 until mid of 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 from 2021. 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 [online](#) 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 to receive 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 should 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).

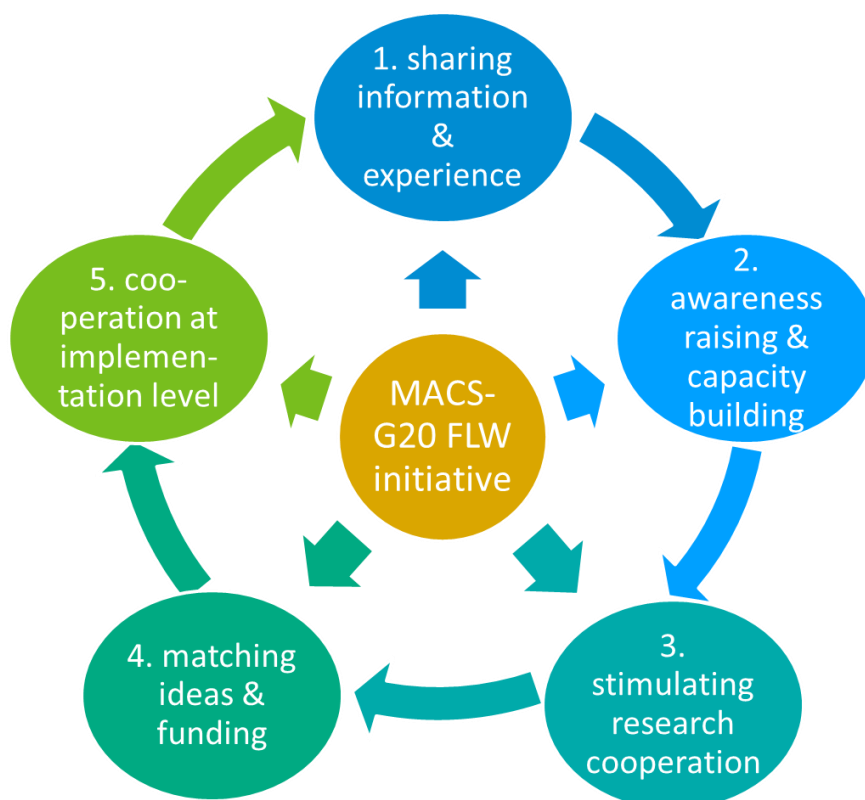


Figure 1 Scheme of the main topics of Collaboration Initiative FLW launched at MACS-G20

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

Since its launch in spring 2016, 155 researchers (2020: 133) from 36 countries (2020: 32) entered their contact data into the database and provided information on 116 projects (2020: 105) related to FLW (Figure 2). Most projects (68) deal with the question on how to reduce FLW by quantity. The most targeted food product groups are vegetables (85), fruit (83) as well as cereal products (78).

All interested colleagues are welcome to contribute further knowledge to the database by inviting additional experts also from non-G20 countries to register and by using the content for their own investigations and network establishment.

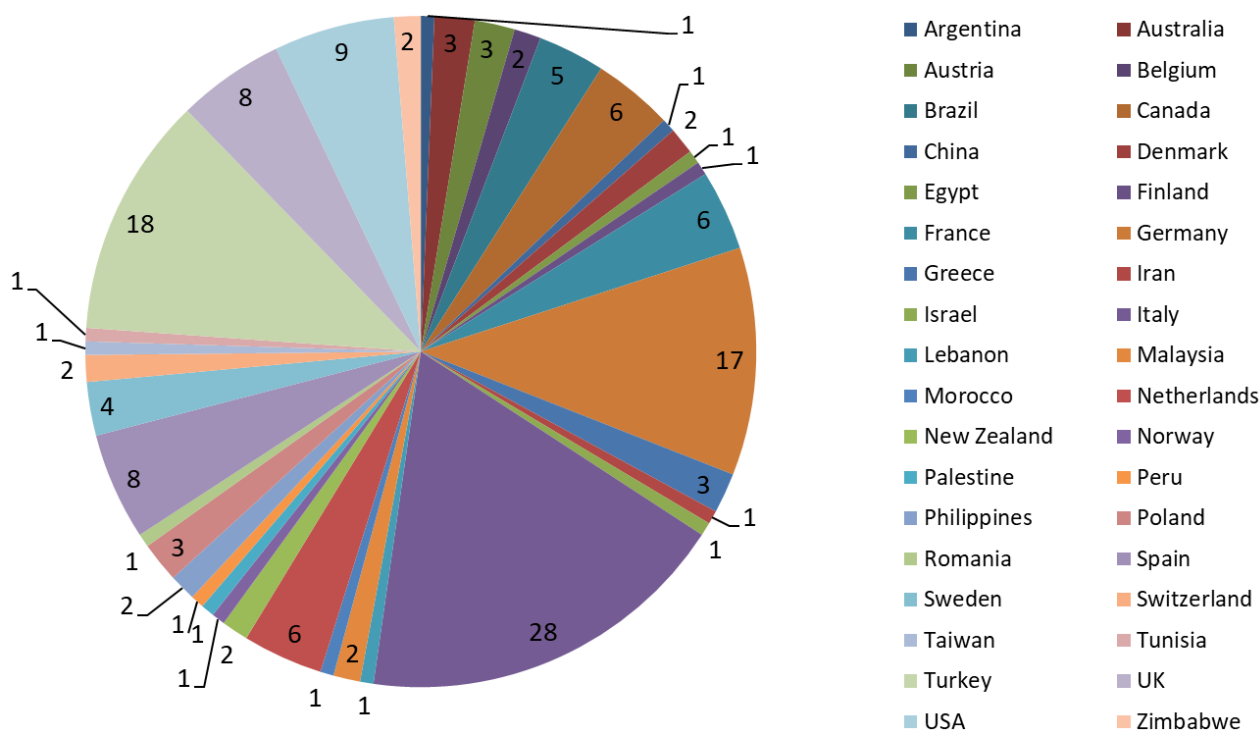


Figure 2 Global distribution of researchers in the Global Food Loss and Waste Research Platform (as of November 18th, 2021).

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 November 2020 to mid November 2021, 1,834 accesses from 77 different countries were counted for the website in total which represents a 7 % increase of access compared to recent years (2020: 1713, 2019: 997, 2018: 920, 2017: 854). Figure 3 shows the visitors' countries of origin wherever this could be tracked. The majority of the visitors came from the USA, Germany, China, Spain, UK, Italy, Brazil, France, Japan, Canada, Mexico and Turkey with more than 20 different counts. Interestingly, the second highest number of users accessed the platform with unknown origin which in the previous year has not been registered to that extent. Looking at the origin of users by continents, America overtook Europe followed by Asia and the unknown users. In total, all continents are represented by at least 13 unique accesses (which were counted from Oceania). For our activities we conclude that we should further strengthen our contacts to interested stakeholders in the global South.

777 visitors (42 %) arrived directly on the website while 727 visitors (40 %) were redirected from other websites. 323 visitors (18 %) were directed to the website by using search engines and some visitors (0.4 %) arrived via social media channels. Those numbers show a surprising increase of redirected visitors from search engines by 10 % since last year.

Interestingly, the evaluation of the number of visitors of our Global FLW expert database showed nearly 50 visitors on September 29th only (= International Day of Awareness of FLW), in comparison to an average which is single digit on other days. We do not know which activity was the reason but somehow we were able to achieve additional awareness on that day.

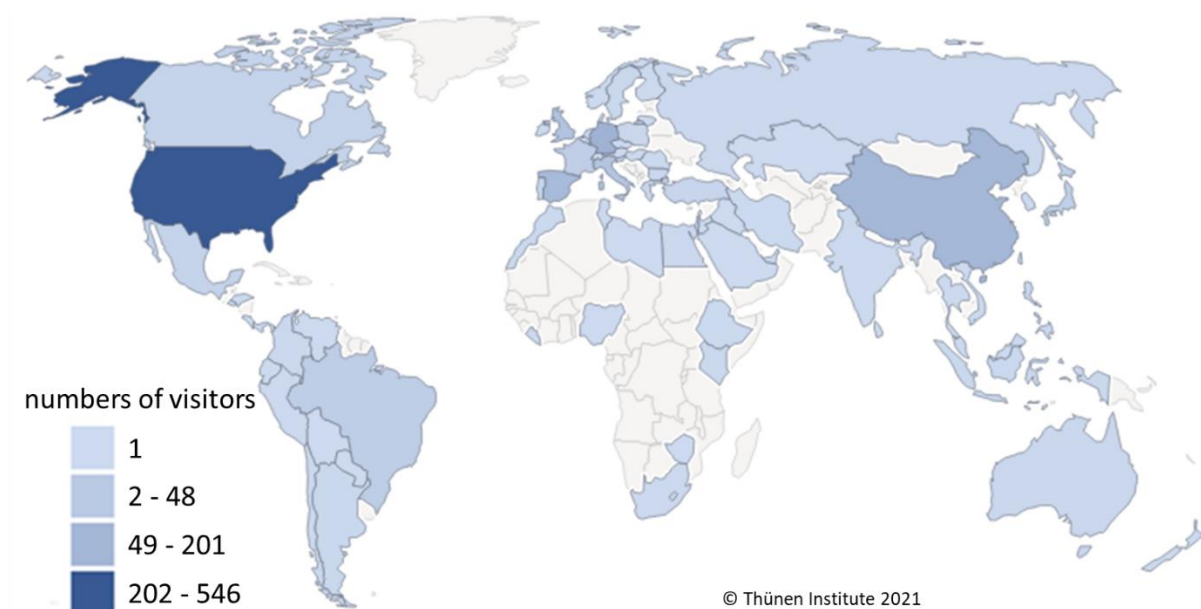


Figure 3 Numbers of visitors at the Global Food Loss and Waste Research Platform in 2020-2021.

3.1.2 G20 under the presidency of Italy

The virtual MACS-G20 took place on 15th and 16th of June 2021 with the main topics on concrete contribution of science to the transformation of agri-food systems towards more sustainable models. During the sessions, topics such as digital traceability, new breeding technologies and the forthcoming United Nations Food Systems Summit (UNFSS) as well as the United Nations Climate Change Conference (Conference of the Parties, COP) were discussed in detail. There was no slot foreseen to present the outcome of our Collaboration Initiative and for the first time since 2015, FLW was not named within the 2021 MACS-G20 [communiqué](#).

3.1.3 5th Regional FLW Workshop

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 which was 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.

This year we were kindly supported by FAO Rome (Italy), UN Environment (France), University Bologna (Italy), University Tuscia (Italy) as well as RSC talent (Spain) in co-organising the 5th Regional FLW Workshop. The aim of the workshop was to support the delivery of the SDG Target 12.3, halving food waste at retail, food service and household level, and reducing food loss across the supply chain as well as to facilitate the cooperation and network building among Mediterranean countries. Due to the pandemic, the length of the workshop was shortened to a one day virtual meeting. The topics therefore had to focus on selected issues which had been identified as relevant challenges within the region: Food Loss in Primary Production, Food surplus and waste from tourism activities as well as addressing food loss and waste in educational campaigns.

As the Mediterranean region is characterised by the influence of three continents and their corresponding culture, policy, infrastructure, legislation and climate conditions, we invited contributors from all three subregions (North African coast, West Asian coast and South European coast) to share their valuable knowledge on FLW prevention. The programme followed our strategy to enhance knowledge exchange and structured discussion among our participants in order to support action. Each session consisted of introductory plenary presentations to provide input into the specific session topic followed by working in groups guided by certain key questions. A final plenary session was scheduled in order to allow a broader discussion of the interrelation of the three session topics and the context with other levels of the food supply chain and finally to summarise the results.

On November 4th, 2021 we welcomed 90 stakeholders from national and local policy makers, universities, private and public research institutions, social welfare organisations, food companies, waste management companies and consultants from 27 different Mediterranean countries!

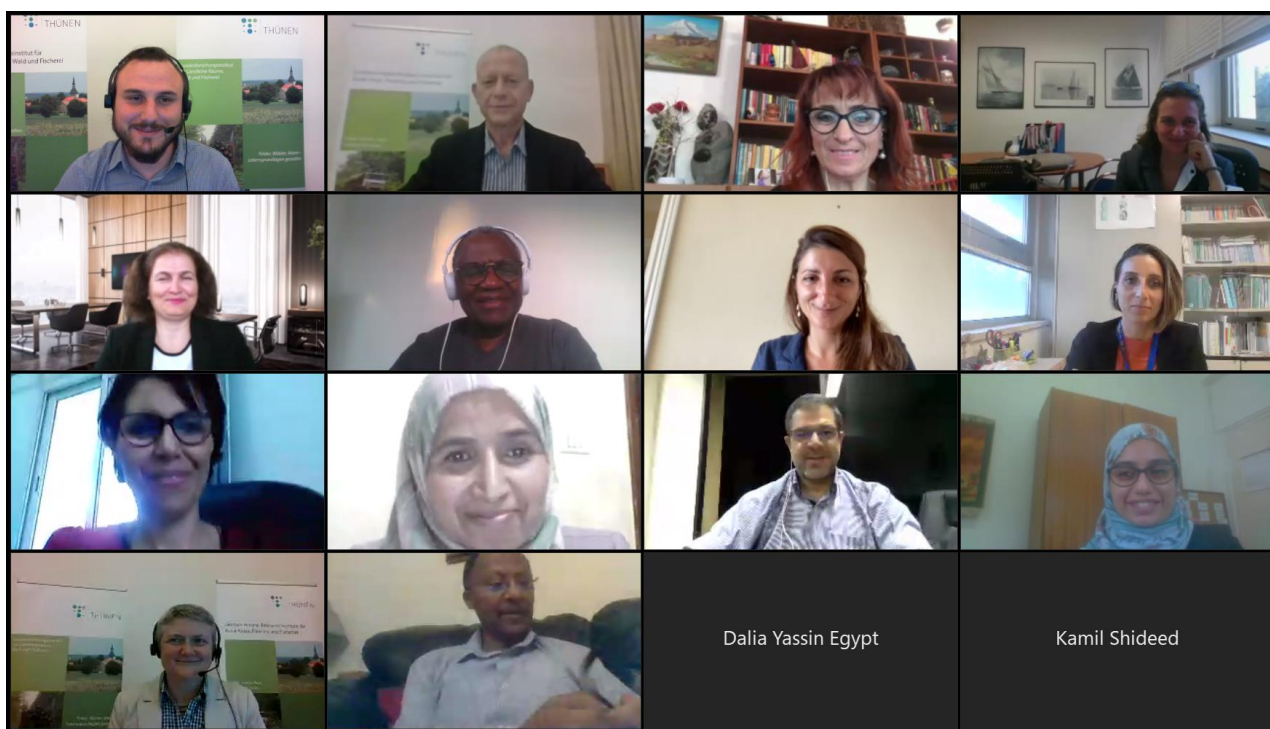


Figure 4 Family photo with a small group of 2021 FLW workshop participants (credit: Benjamin Golub).

With examples from Spain and North Africa, the speakers in the first part presented measurable economic, social and environmental impacts that could be achieved with the reduction of food losses in agriculture. The second part started with how surpluses from cruise ships can be used for the socially needy. Afterwards, a representative from Greece reported on her experiences with the conversion of tourism waste into animal feed. The thematic focus on tourism was concluded by measuring food waste in all-inclusive hotel facilities in Turkey.

At the beginning of the third workshop part, information was provided on teaching and learning materials for schools of the "Do Good: Save Food!" campaign. A Tunisian contributor explained how an online campaign against food waste in university canteens was perceived by guests. And finally, there was a presentation on avoiding bread waste by turning it into animal feed which was the focus of an awareness-raising campaign for households and businesses from the Palestinian Autonomous Territories.

The agenda, a list of participants as well as some photos (please scroll down) are provided to the public for further inspiration and networking at the Initiative's [website](#). The presentations will follow after presenters' legal approval. Figure 4 to Figure 6 provide insights into the virtual workshop setting.



Figure 5 Setting at Thünen Institute for the workshop with Benjamin Golub (left), Felicitas Schneider and Stefan Lange (right) (credit: Michael Welling)



Figure 6 Screenshot of a working group session moderated by Dr. Sharif Muhammad from The Islamic World Educational, Scientific and Cultural Organization. (credit: Benjamin Golub).

We would like to thank our cooperation partners from Italy, France and Spain as well as the presenters and moderators of the working group sessions for their generous support of the FLW workshop! Special thank is also directed to our Thünen colleague, Benjamin Golub, who supported Stefan and Felicitas with the technical and organisational issues.

3.1.4 European Platform on Food Losses and Food Waste

In 2016, the European Platform on FLW was established with the aim to bring together institutions of the European Union, experts from EU member countries and relevant stakeholders to defining prevention measures, sharing best practice and evaluating progress made over time. The initial mandate has been extended by 2 years until end of 2021 in order to pursue the platform's work and finish ongoing projects. The EU Commission decided to re-establish the platform for another 5-year term from 2022 to 2026. In addition to public entities such as EU member states, EFTA countries, EU bodies and international organisations, private sector organisations were called to apply for joining the platform as members for the new term. The Thünen Institute was one of the selected members and will contribute its expertise to the platform work. For further information e.g. on results of all platform meetings or the new list of members, please see the official [website](#).

3.1.5 Update on FLW activities in Australia - Fighting the good fight to stop food waste in Australia²

2021 has undoubtedly been a big year in the life of Fight Food Waste Ltd, the Australian entity behind the [Fight Food Waste Cooperative Research Centre](#) and [Stop Food Waste Australia](#) (Figure 7).



Figure 7 Logos representing Fight Food Waste Cooperative Research Centre and Stop Food Waste Australia

The year started with the creation of Stop Food Waste Australia following a competitive tender process to develop a national food waste governance entity by the Federal Department of Agriculture, Waste and the Environment. The new division has four focus areas: a voluntary agreement, sector action plans, communication, engagement and partnering for impact, and monitoring and reporting.

In September, we launched the SFWA [Strategic Plan](#), which details how we will work with industry, government and food rescue sectors to help meet the Federal Government's goal of halving Australian food waste by 2030.

The first year of operations culminated with the October 21 launch of industry-focussed voluntary commitment program, the [Australian Food Pact](#), by the Hon. Sussan Ley MP, Minister for the Environment. Modelled on similar proven overseas agreements such as the UK's Courtauld Commitment, the eight initial signatories included some of the biggest names in the Australian food industry: ARECO Pacific, Coles, Goodman Fielder, McCain Foods, Mars Australia, Mondelēz Australia, Simplot Australia and Woolworths Group.

The response from industry to the pact has been heartening, and we are aiming to have a total of 25 signatories join by the end of 2021, and for a total of 50 by mid-2022.

² This section was kindly provided by Dr Steven Lapidge from Fight Food Waste Cooperative Research Centre/Australia.

Another vital component of SWFA's activities are Sector Action Plans (SAPs), in which we work together with industry to target food waste 'hotspots'. We have already developed SAPs for the food cold chain and food rescue sectors, and work is now under way on dairy and grains/bakery SAP's, with food service, horticulture and seafood and SAP's likely to commence in 2022.

Highlights this year for the Fight Food Waste CRC were working with our partners KPMG and Foodbank Australia to deliver the landmark report '[A National Food Waste Tax Incentive: Boosting food relief through Australia's tax system](#)', and we continue to work with the Australian Government on the next stages of this exciting and important project.

Food packaging was a strong area of focus for the CRC in 2021, as we worked together with the [Australian Institute of Packaging](#) and numerous industry partners to develop knowledge and expertise around save food packaging. Through this collaboration, we were able to begin developing food packaging criteria and guidelines for the sector, including shelf-life extension, resealability, date labelling and packaging design. We have also worked with South Australia (SA) food and beverage businesses in the Sustainable Save Food Packaging project, which delivered tailored training to the SA food industry with the aim of increasing industry's understanding of the relationship between packaging and food waste.

Households are the single biggest contributors to food waste in Australia, representing more than half of the annual \$36.6 billion cost to the economy, and much vital research was done through the [Designing Effective Interventions to Reduce Household Food Waste](#) project in determining the how, why and where food waste occurs in the Australian home.

This study led into the Nationwide Consumer Behaviour Change Campaign Summit, held in October, which saw nearly 50 stakeholders from industry, government and for-purpose sectors gather virtually to discuss and agree upon a course of action for a nationwide consumer food waste behaviour change campaign.

To have such participation from key stakeholders represented a considerable step forward in a collective determination to effect meaningful national change, and we look forward to the working group formed from the summit advancing governance and funding frameworks in 2022.

On November 17 and 18, we effectively concluded our busy year with our [Annual Conference](#) and Annual General Meeting, which was held virtually this year due to ongoing travel restrictions caused by the global pandemic.

While 2021 was a full and productive year, we know there is still much more to be done. We have commenced planning for the inaugural Stop Food Waste Australia summit in 2022, while taking note of the latest information and data contained in the FIAL [National Food Waste Strategy Feasibility Study](#) launched in September.

That study indicates that we can indeed halve food waste by 2030, "but it will require unprecedented action by governments, industry and the community".

The numbers in the study are challenging but not insurmountable. In Australia, some 7.6 million tonnes of food are wasted each year, with 17.5 million tonnes of CO₂ emissions produced each year – all in a time when one in five Australians are still food insecure.

In a post-pandemic 2022, Fight Food Waste Ltd is ready to continue working with its industry, government and for-purpose sector partners to build upon the momentum created through our work in 2021, and help lead Australia further towards achieving its food waste goals - to halve food waste nationally by 2030 in line with the United Nations Sustainable Development Goal 12.3.

3.1.6 Update on FLW activities in Germany³

The German [National Strategy for Food Waste Reduction](#) was introduced in 2019. There and also within the present Coalition Agreement which was released in December 2021 it is stated that the German government will work together with all stakeholders to reduce food waste on a binding, sector-specific basis, clarify liability issues and facilitate tax relief for donations. The so-called [National dialog forum](#) unites stakeholders from the entire food supply chain while five specific dialogue fora - one per sector: primary production, processing, wholesale and retail, out-of-home consumption, household - focus on specific levels. To sign a [voluntary agreement](#) per sector is the main output of those dialog fora. The first, the forum on [out-of-home consumption](#), is already in a next period, where companies are attended by executing their monitoring and implementing more FLW reduction measures. Thünen Institute together with partner organisations is actively involved in primary production, processing as well as wholesale and retail forum. A retail-FW-monitoring was conducted ([Orr & Schmidt 2021](#)). Many branch-specific round tables are installed to discuss FW reduction activities as well as voluntary agreements concerning the SDG 12.3 target.

In 2012, the awareness-raising campaign “[Too good for the bin](#)” has been implemented in Germany. Each year innovative projects and activities focusing on FLW prevention are awarded with the Federal prize. Since 2020, the prominent jury members are supported by an expert advisory board to which Thünen Institute also contributes.

In our 2020 report, we reported about the ELoFoS (Efficient Lowering of Food Waste in the Out-of-Home Sector) research project, where Thünen Institute and partners are investigating efficient measures to reduce food waste in the out-of-home sector in Germany. In the process, strategies and innovations are being developed using the practical example of a commercial kitchen with suppliers. First, we collected information on the generation, composition and value of food waste as well as their disposal reasons at four locations in the hotel business. Next, we optimised the hotel-supplier interface for fish and meat products. Our food waste reduction measures were evaluated in a further FW monitoring in three large kitchens in the care sector. From these results, complemented with literature research, we will draw strategies and measures for avoiding FW. The costs for prevention, such as the cost of staff training, were considered when evaluating our prevention measures. Furthermore, the transferability of the strategies and measures to other out-of-home sectors were investigated. Publications can be found at section “publications” within the [present report](#) and at the [project website](#).

A PhD-project was continued at Thünen Institute on a topic concerning ‘[Food loss reduction between primary production and retail: an impact assessment of regulatory and market-based policy instruments](#)’. Recently, a row of interviews was conducted to evaluate the approach: Bargaining power at the producer-retailer interface and resulting food losses of highly perishable produce: a qualitative assessment of actor relationships at early stages of the food supply chain.

A sustainability assessment of food waste reduction measures was developed by our colleagues ([Goossens et al. 2021](#)). To identify promising food waste reduction measures, a thorough sustainability evaluation is needed to assess the effectiveness and efficiency of measures. This evaluation framework follows the classical cost-benefit-analysis approach whereby costs and benefits are assessed across the three sustainability dimensions (economy, environment and society). It is crucial to know beforehand – before implementing the measure - which data will be needed to evaluate that measure so that information can be collected at the moment the resource inputs and outputs occur.

The Bundesrat, the upper house of the German parliament, released a resolution which calls on the Federal Government to take some concrete measures: Examining the limitation of civil and criminal liability for food donations; reviewing the regulations on the best before date; providing targeted support to food redistribution

³ This section was provided by Dr Thomas Schmidt from Thünen Institute of Market Analysis.

and food sharing organizations; distinguishing marketing and quality standards that are legally required at the EU level from voluntary quality standards; including the topic of food appreciation in the training regulations of all professional groups; considering the prevention of food waste in public tenders; developing a suitable method for quantifying food waste and regularly reporting.

A survey was conducted by GfK, a market research institute, on behalf of the German Federal Ministry of Food and Agriculture (BMEL). They provide representative results on the type and composition of food waste generated in German private households. Even though the actual amount of food waste in households is probably higher than recorded by diary entries, the study provides valuable information about the reasons for throwing away food, the used disposal routes and the proportions of the individual product groups of food disposed of in private households.

The first obligatory EU reporting will be conducted by German Federal Statistic Office based on waste statistics and food waste coefficients to calculate the share of food waste within the available waste volume data. The first reporting from all EU member states to Eurostat is scheduled for June 2022.

3.1.7 FLW activities by University of Bologna/Italy⁴

The most important activity led by the UNIBO team from the Department of Agriculture and Food Science and Technology on food waste in 2021 is about food waste accounting and monitoring.

The team has been involved in different quantification projects: first, the SEIZERO project, coordinated by Luca Falasconi, was concluded this year. The project was financed by the Ministry of Environment of Italy, to quantify food loss and waste at processing and wholesale stages, probably the most complicated stage for monitoring. The project was indeed very challenging: a snowball sampling started in late 2019 to reach the largest possible number of companies for interviews about their food waste. Despite the attempts, only 16 companies agreed to share their food loss and waste data, yet often omitting important information. The fear of losing reputation by revealing food loss and waste quantities at the processing stage is still the main obstacle for quantifying food waste at this stage of the Food Supply Chain, even more important than the difficulties with the sampling strategy and the limitations of questionnaires as a method. However, the project ended with a quantification for the sectors of dairy, bakery and pastry, fruit and vegetables processing, and meat processing; results will be published in 2022.

At the same time, the UNIBO team has been assigned the quantification of FLW for Italy. The quantification aims at providing a baseline dataset of food waste based on the EU methodological framework, and the results of the project will be transmitted to the EU Commission (EC) at the end of 2021. Targeted stages were households, catering and agriculture. For the households, the diary method has been used as it was in 2019, in the framework of the [REDUCE](#) project, both because of logistical limitations in applying the waste audits at national level and to ensure comparability with 2017. Results will be transmitted to the EC through the competent authorities (ISPRA and Ministry of Ecological Transition) and will be published in peer review journals, hopefully in 2022!

Since January 2021, the UNIBO team has been involved in designing a methodology to quantify the impact of food waste reduction innovations within the [LOWINFOOD](#) project activities (see also section 3.3.4). As task leader, it was the team's duty to provide a methodology to assess efficacy of the 11 innovations. A Delphi process was set up and led to the definition of a detailed methodology that will now be applied in the pilot testing of the innovations.

Last Minute Market (a company that was born as spin-off from the University of Bologna) is now in the EU Platform for food Loss and Waste! In 2021, Last Minute Market and the UNIBO team created the "[Waste Watcher](#)

⁴ This text was kindly provided by Dr Claudia Giordano and Dr Luca Falasconi from UNIBO.

[International Observatory on Food and Sustainability \(WWIO\)](#)”, starting from the experience of the Waste Watcher Observatory, born in 2015. More info is provided in the Box 1.

Box 1: Waste Watcher International Observatory

In 2021, Last Minute Market and UNIBO team created *Waste Watcher International Observatory on Food and Sustainability (WWIO)*.

The Waste Watcher international (WWI) Observatory aims to provide the community with knowledge and tools for investigating social, behavioral and lifestyles dynamics behind household food waste. By focusing on the economic, social and environmental impacts of the phenomena, the Observatory stands to generate common and shared knowledge, to guide private and public policies for food waste prevention and reduction and to improve food resources use efficiency, in Italy but not only there.

The Waste Watcher Observatory is based on a scientific sounding method and conducts research based on opinions, self-perceptions and declarations.

This year, for the first time, WWI decided to give to the initiative an international scope recognizing that the pooling of data and insights on the phenomenon will be fertile ground for the development of individual initiatives, business strategies and public policies for the prevention and reduction of waste, the optimization of the use of natural resources and the promotion of healthy and sustainable diets. As WWI, we believe that it is not enough to tackle the problems at a local or national level. We are all involved in our future, and we can share and develop ideas, tools and solutions together in order to give a common answer to common problems. In addition to Italy, the USA, Canada, China, Spain, Germany, UK and Russia joined in the year 2021.

The survey on food waste is based on field research, with a structured questionnaire of about twenty questions that investigate: food purchasing behaviors, food diets and the waste of products for all main agri-food technologies.

Publications from UNIBO team members can be found in section 3.6.

3.1.8 Sustainability Special issue on National FLW Prevention Strategies and Monitoring Approaches

There are only nine years left until the member countries of the United Nations are supposed to have achieved target 12.3 of the sustainability agenda: halving food waste in retail, out-of-home catering and private households and reducing food losses in the upstream value chain. Reason enough to draw up a global interim balance and to gather both positive and negative experiences with national strategies and their implementation. In May 2020, Thünen colleagues Thomas Schmidt, Stefan Lange and Felicitas Schneider launched an appeal to the international research community asking them to publish scientific results in a special issue of the journal Sustainability that they edited together.

In total, ten articles from nine countries could be published, covering all five continents: one contribution each was added by Egypt, Germany, Great Britain, Italy, Japan, New Zealand, the Netherlands and the United States of America, while two articles were written in Saudi Arabia. In terms of content, colleagues shared their experiences about losses in primary production to food waste from private households, addressing methodological proposals, challenges and experiences in national monitoring, global knowledge gaps, effects of innovative technologies, policy options for action as a G20 presidency country and practical lessons learned from the implementation of waste prevention measures.

All articles were critically examined by professional experts and the corresponding feedback was incorporated by the authors. The publications are freely accessible to the public and can be [downloaded](#) free of charge.

We would like to thank all those involved for their contribution to the current state of play in the field of national strategies against food loss and waste.

3.1.9 Selected FLW activities in Spain⁵

The FLW activities conducted by Héctor Barco Cobalea from the University of Deusto/Enraíza Derechos and Maria-Angeles Fernandez-Zamudio from the Valencian Institute of Agricultural Research (IVIA) which were summarised already in our 2020 annual report, could be continued during 2021 with the following updates.

First, the PhD thesis “Methodology to facilitate the FLW quantification along the agri-food chain and different territorial scales” was applied in practice in order to identify the different entities/economic activities to be quantified along the entire agri-food chain in the region of Valencia, in line with the Delegated Decision using the 4-digit NACE codes and Geographic Information Systems. Figure 8 and Figure 9 show selected results from this analysis.

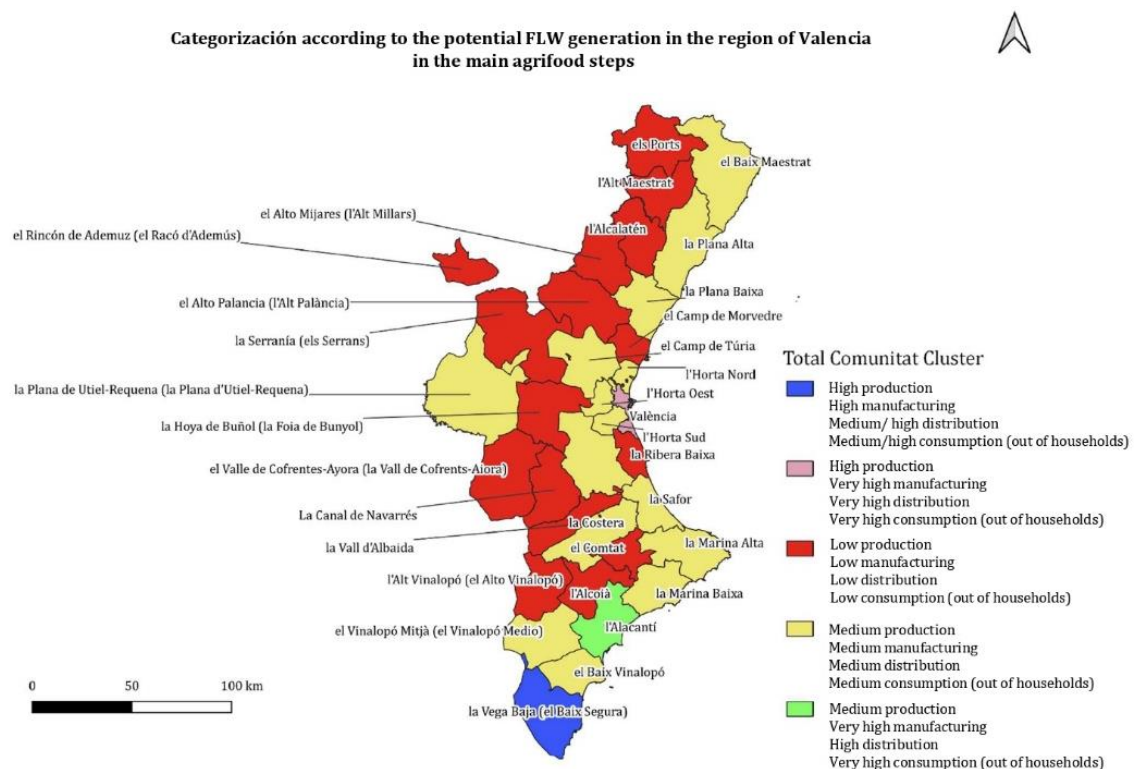


Figure 8 Map of the cluster analysis for Valencian communities related to potential FLW generation within different parts of the agri-food chain (credit: Héctor Barco Cobalea)

⁵ The text and the figures were provided by Héctor Barco Cobalea from University of Deusto and Maria-Angeles Fernandez-Zamudio from Valencian Institute of Agricultural Research (IVIA).

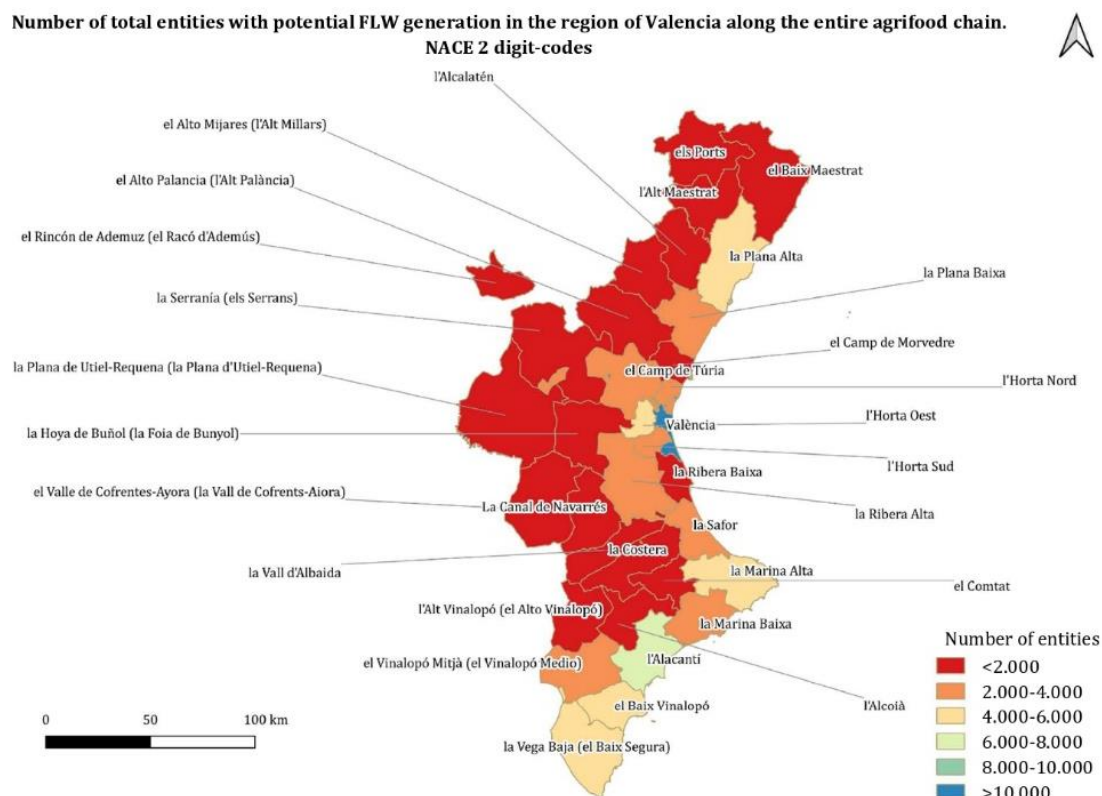


Figure 9 Number of Valencian communities potentially generating FLW according to NACE 2 digit codes (credit: Héctor Barco Cobalea)

Concrete recommendations have been put forward in order to identify which specific economic activities with potential FLW generation must be quantified along the entire agri-food chain. The applied methodology clarified some inconsistencies from the Delegated Decision Delegated Decision (EU) 2019/1597 of 3 May 2019 and the following results could be highlighted:

1. The areas with the largest concentration of each of the economic activities with potential FLW generation, using 4-digit NACE codes, in the region of Valencia.
2. The establishment of different district profiles, according to the number of entities with potential FLW generation along the entire agri-food chain.
3. Synergies between the use of the NACE codes and the Geographic Information Systems (GIS) with other lines of action of the Regional Plan of FLW, as the case of the FLW estimations through the compositional analysis.

Second, study results titled "[Citizens' Food Habit Behavior and Food Waste Consequences during the First COVID-19 Lockdown in Spain](#)" were published as a scientific paper in cooperation with colleagues from the Center for Agro-Food Economy and Development and Fundación Espigoladors. The main objective of this paper was to understand citizens' food waste (FW) behavior during the first COVID-19 lockdown in Spain by recognising related food practices that could have influenced the FW generation. An online survey was conducted from May 14th to June 11th, 2020. In total, 6293 valid responses were collected and analysed. The paper is available free of charge due to open access.

Maria-Angeles from IVIA was further involved in a school food waste quantification project. The perception of food waste in the school community was analysed by taking a sample of seven schools in the province of Valencia, in which students, teachers and families were surveyed. The waste generated in these school canteens (post-consumer waste) was also measured. The result was an average of 113 grams per student per day, which

represents approximately 24% of the mass of the menu served. This is a large amount of FW and it is necessary to continue working with the school community to reduce it.

Hector from the University Deusto applied his PhD thesis “Methodology to facilitate the FLW quantification along the agri-food chain and different territorial scales” in order to identify all the different entities/economic activities to be quantified along the entire agri-food chain in the five municipalities of the Cuadrilla de Ayala (Basque Country, Spain), in line with the Delegated Decision using the 4-digit NACE codes and Geographic Information Systems. Results are already available (Figure 10 and Figure 11). Firstly, entities to be quantified along the entire agri-food chain were identified and secondly, the FLW problem was measured for one week, using scales, in some of these entities identified.

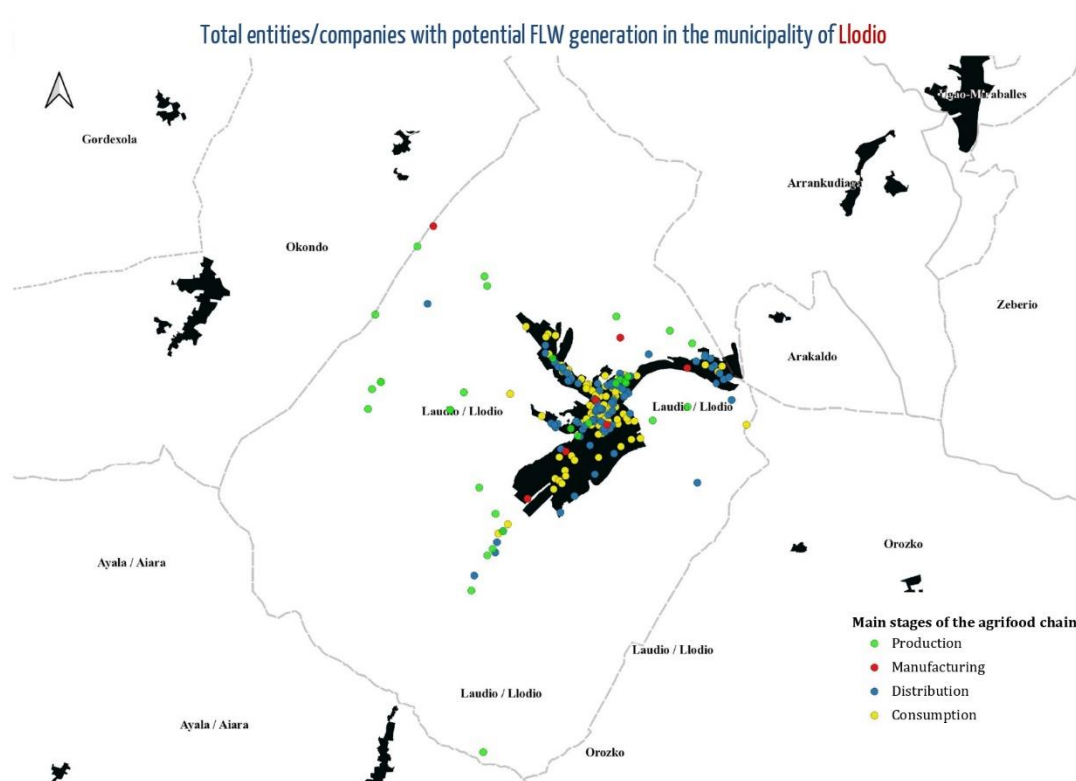


Figure 10 Map representing total entities and companies potentially contributing to FLW generation in municipality of Llodio (credit: Héctor Barco Cobalea)

Entities measured under the NACE code 47.21 (within the distribution stage of the Cuadrilla de Ayala)

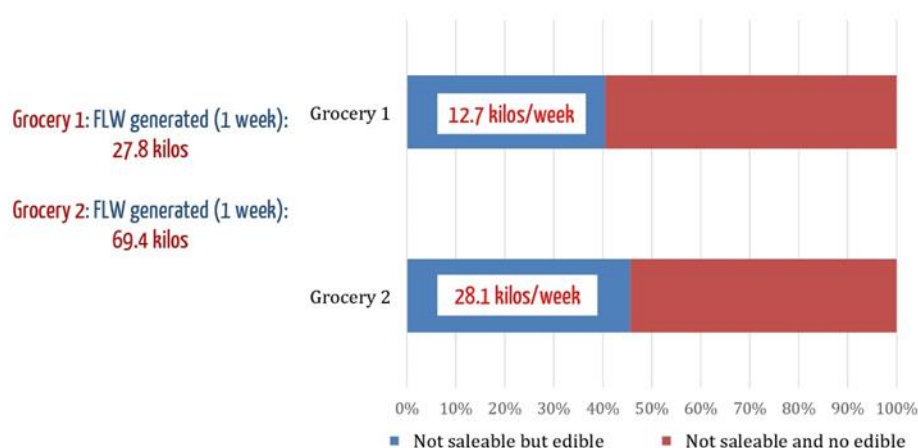


Figure 11 Case study result for food distribution (NACE code 47.21) within Cuadrilla de Ayala (credit: Héctor Barco Cobalea)

Further activities tackling FLW in collaboration with the Thünen Institute can be found in section 3.3.2.

3.2 Topic 2: Awareness Raising & Capacity Building

3.2.1 International Day of Awareness of Food Loss and Waste

The 29th September this year was also celebrated by several global organisations, research institutes and stakeholders dealing with FLW prevention. We at the Thünen Institute are very proud that we were able to support this great idea from the very beginning in 2018 and of course, we did not hesitate to implement an awareness raising event although pandemic-related restrictions were in place in Germany. In 2021, we had four different approaches:

- A national press release introducing the problem within Germany and possible solutions in general.
- A regional press release with problem, solutions and local event announcement.
- A local Day of Action at Braunschweig city centre targeting local population.
- A Thünen-wide online presentation of research results related to persimmon losses at harvest and storage in cooperation with our Spanish partners.

ad a.) The national press release targeted the general public, introducing them to the topic on a [global and national](#) scale and providing links to recent project results from the Thünen FLW activities. Different German magazines used information from our press release which made this activity very successful. This year, a German radio channel introduced a focus on FLW for a few days related to the International FLW Awareness Day.

ad b.) The regional press release focused on the local event (see c.) and announced the different practical issues which were offered on-site for direct implementation into real life. The link to more information was also provided but less prominent. The result was an advertisement within the local print newspaper and also a post-article on the event.

ad c.) As the Thünen Institute headquarter is located in Braunschweig, which is a medium size German city of approximately 250,000 inhabitants in Lower Saxony, we collaborated with civil society organisations for raising awareness of the general public on September 25th, 2021. This year we organised the event in cooperation with the Technical University Braunschweig as a location host who initiated a one-year lasting real laboratory

dedicated to the topic “sustainability” at a central place near the city centre. Thus, our topic of food loss and waste awareness raising fitted perfectly and we planned the event for a Saturday. As in the previous year, we invited local food-related initiatives and research organisations to join us. Finally, foodsharing, Mobile Klimaküche Braunschweig, Agnes-Pockels-Schülerinnen-Labor from the Technical University Braunschweig and proveg international contributed to the event. We emphasised the value of food in general, primary food production, fair food pricing, impact of animal-based food on sustainability, understanding biochemical food aging processes, how to prevent surplus food at home and activities towards rescuing food from disposal. Mobile Klimaküche Braunschweig prepared delicious food made from rescued food products on-site.

As the Thünen Institute, we provided insights into our research results by offering posters, a video about innovative professional fishing equipment reducing by-catch and an interactive online memory and quiz suitable for different age groups (Figure 12). Supported by a sunny day we had good discussions with interested stakeholders from different age groups.



Figure 12 Thünen Institute colleagues Thomas Schmidt surrounded by a school class (left) and Benjamin Golub and Sabine Ludwig-Ohm at the stall (credit: Felicitas Schneider).

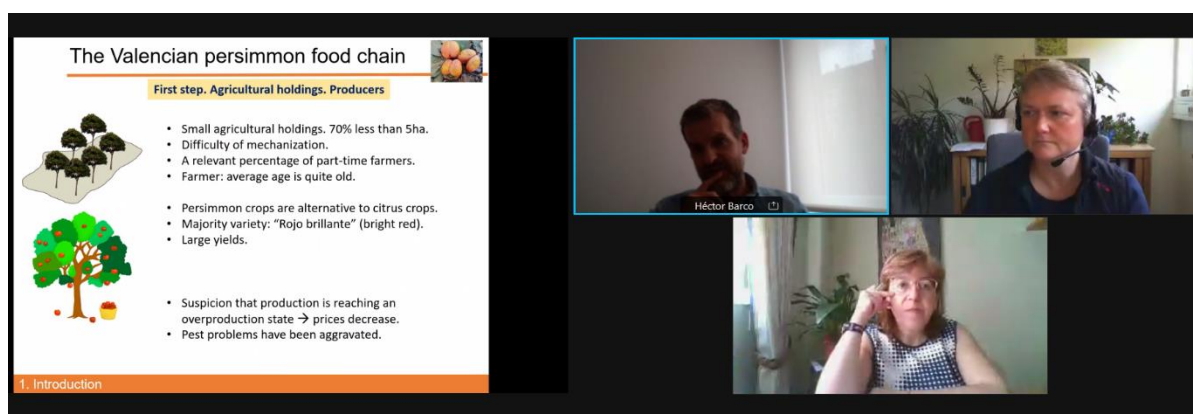


Figure 13 Snapshot of the presentation on persimmon losses in Valencia region given by Héctor Barco, Maria-Angeles Fernandez-Zamudio and Felicitas Schneider (credit: Benjamin Golub)

ad d.) As a part of pandemic measures, most of the Thünen Institute staff members received access to an online video conference tool which made it possible to offer a FLW discussion for all of our 14 specialist institutes and back-office units located at nine different Thünen locations in Northern Germany. On September 29th, we offered results from the joint study on persimmon losses with our Spanish colleagues which is also addressed in section 3.3.2. Our colleague Sabine Ludwig-Ohm from the Thünen Institute of Farm Economics chaired the online event and moderated the very rich discussion after the presentation. After a brief introduction given by Felicitas, a very

colourful and informative presentation was conducted by Héctor Barco Cobalea and Maria-Angeles Fernandez-Zamudio (see also section 3.1.9 and 3.3.2).

3.2.2 Cooperation with Sino-German Agricultural Centre

In the course of 2021, the Sino-German Agricultural Centre (DCZ) organised a series of virtual “Exchange Forum on Sino-German collaboration in agricultural sciences” with the Chinese Academy of Agricultural Sciences (CAAS) as a host and selected German research organisations as invited speakers. On April 29th, 2021 the topics of the first meeting were related to transition of agricultural food and food systems including risk management evaluation, crop diseases and insect pest detection, organic agriculture as well as food loss and waste. Among other German researchers, our Collaboration Initiative was invited to provide a brief summary of ongoing activities. Since CAAS and the Thünen Institute already signed a Memorandum of Understanding back in 2017, the present activity was a very good opportunity to update topics and interests for collaboration. From the CAAS Agriculture Information Institute’s side, Dr Huang Jiaqi who already participated in our Regional FLW Workshop in Tokyo in 2019, provided interesting insights into her own FLW research and identified research gaps in China. In the following discussion, a fruitful exchange was the beginning of further joint activities which are more detailed in section 3.2.3. More information on the exchange forum can be found in the [DCZ newsletter no. 14](#).

In September, we were invited by DCZ to contribute a cover story to the [DCZ newsletter no 16](#) related to global FLW initiatives, policies and developments. We thank DCZ for providing its agricultural network for distribution of FLW information!

3.2.3 Cooperation with the Chinese Academy of Agricultural Sciences⁶

Over the past one and half year, there has been a wide range of debates and forums that have united all member countries of the United Nations worldwide as well as thousands of interested parties in joint work. The UN Food Systems Summit on 23 September 2021 was the culmination of an intensive and inclusive discussion process on concrete changes to our global food system.

Being a part of the advisory and consultancy committee of China’s development of the anti-food waste law, the scientific group that our colleague from Chinese Academy of Agricultural Sciences (CAAS), Dr Jia, presented made contributions to the law-making towards systemic perspectives and approaches to dealing with food waste. China’s anti-food waste law, issued in April 2021, provides a regulatory framework that integrates food losses and waste, food safety, environment and sustainability.

Against this background, CAAS collaborated with the Thünen Institute and jointly hosted the thematic session on food loss and waste at the United Nations Food Systems Summit [Independent Dialogue](#) “Innovative Partnerships and Value Co-creation” on September 15th, 2021.

As the collaborating partner from CAAS, Dr Jia has been inspired by his collaboration with the scientists from the Thünen Institute. Dr Felicitas Schneider and Mr. Stefan Lange presented expertise in the topics and open minds for innovative solutions to the problems, from technical, institutional and cultural perspectives. Although the pandemic halted international travelling, the research collaboration between CAAS and the Thünen Institute was further strengthened in the year 2021. We look forward to jointly developing research and promoting the consortium of food system transformation between CAAS and the Thünen Institute.

⁶ The section (text and photos) was kindly provided by Dr. Xiangping Jia from Chinese Academy of Agricultural Sciences (CAAS).



Figure 14 The UNFSS Independent Dialogue, in hybrid forms (credit: Xiangping Jia, CAAS)

3.2.4 Cooperation with the University of Saint Joseph in Macau⁷

In July 2021, we were able to continue our long-lasting cooperation with the University of Saint Joseph in Macau which in the past included e.g. a valuable contribution by Dr Warren Li within the Regional FLW Workshop in Tokyo in 2019, presenting [interesting insights](#) from his work experience.

The [“2021 Seminar: Food Sustainability and Waste Reduction – A Platform for Action”](#) was organized by the University of Saint Joseph’s Green committee, to bring together academics, NGOs, industry, and local schools, in order to raise awareness to food waste globally and locally, define strategies to tackle the problem, and discuss how to implement them in Macau.

Our main target audience consisted of individuals working on food production and food sustainability, but also the general public in Macau and abroad interested in sustainability.

The event consisted of five presentations, followed by a round table discussion. A short description of each is provided below:

- a. Tackling global Food Loss and Waste through joint action: The presentation provided an overview of multilateral activities towards fighting food loss and waste as well as some findings from German research. By Dr Felicitas Schneider (Federal Research Institute for Rural Areas, Forestry and Fisheries, Germany) -
- b. Food waste prevention and management: Macao perspectives - Overview of Macao’s waste management system, waste generation and waste composition, and of possible strategies for the future. By Fr. Franz Gassner (USJ, Associate professor, Dean of Faculty of Religious Studies and Philosophy) and Dr Warren Li (General Manager, Ultra Clean Waste Services Limited).
- c. Turning food waste into biodegradable plastic using engineered E. Coli: Present international awarded school project to produce biodegradable plastic through the use of E. coli. By Ms. Cheng O and students (Pui Ching middle School) -
- d. Food literacy: food is more than taste: Food is the strongest lever to optimize human health and environmental sustainability. People can spread the culture of voting with their chopsticks for the health of people and planet. By Ruby O (Chairperson of NGO Food & Environmental Health) -
- e. A food waste reduction initiative in Macao: Present the initiatives of the association, in a city that has all conditions to be an example regarding environmental awareness. By Gilberto Camacho (Funding member of NGO Macau ECONscious).

⁷ The text for this section was provided to a large extent by Prof. Maria Rita Silva from University of Saint Joseph.

- f. Roundtable - Food sustainability and waste reduction strategies: The presenters and member of the audience discussed practical strategies that can be implemented locally to reduce food waste. Some of the strategies discussed included: (1) reducing the use of buffets in the hospitality industry, (2) restaurants providing the choice of smaller portions to patrons, (3) smart shopping strategies in order for individuals not to buy more than what is needed, (4) selling close to validity date food at discount rates, and (5) directing good quality food waste to solidarity institutions.

The outcomes of the seminar can be concluded as follows:

- Increased awareness of the food waste problem globally and in Macau
- Development of a network of people in different sectors interested in reducing food waste and promoting food sustainability.
- Establishment of community fridge project targeting low-income immigrant communities in Macau: NGO Macau ECONscious had this project in the pipeline for two years, and through the synergy created in this event, the organisers were able to find a venue for them to establish a community fridge in a Pastoral community centre that works with low-income immigrant communities.

The USJ Green committee aims to organize future events related to food sustainability and food waste reduction in the future. In fact, another event is being planned for 2022.

3.2.5 Cooperation with University Bologna/Italy

In the framework of the Annual National Congress of Italian Agrarian Economists (SIDEA 2021), held on September 16 to 17, 2021, a [side event](#) about food waste was organized by the UNIBO team. The event consisted of a talk based on four questions about food waste, with the goal of drawing the state of the art of food waste on specific topics (Table 1). Invited speakers were Felicitas Schneider, Silvia Scherhauser, Julian Parfitt and Christian Reynolds, and the talk was moderated by Claudia Giordano and Fabio De Menna. From the talk, the need for a tighter trans-disciplinary approach to the issue and the urgency to engage the private sector clearly emerged, thus supporting the data release from companies and a more collaborative approach also from small and medium companies.

Table 1 Questions for the speakers at SIDEA, 2021 (16-17 September, online event)

How systemic and structural approach to food waste can reconnect the food waste discourse to the Farm to Fork strategy?
How much food loss and waste is generated in the farming/processing/manufacturing stages and why? What are its main characteristics and causes? What are the impacts? Are there – if any- unfair trading practices enhancing food waste generation?
Are there innovative methodologies to detect FLW hotspots at production and processing stages?
Can citizens nudge companies to reduce their food waste and how? What strategies can be adopted to stimulate FSC stakeholders to cooperate in providing access to data and reducing food waste?

3.2.6 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”. In order to complement the study programme, our coordinator Felicitas prepared and conducted the course “Sustainable Waste Management in Coastal Communities” in June 2021. As Felicitas worked in waste management research and teaching for 16 years previous to her coordinator position at the

Thünen Institute, this was a good opportunity to combine different topics. Beside the basics of general waste management focused on coastal regions, the international students from Canada, UK and USA heard a lot about FW generation and prevention embedded in global framework. The two-week course was accompanied by excursions and guest speakers from local waste management as well as harbour authority. The course will be repeated in June 2022.

3.3 Topic 3: Stimulating research cooperation

3.3.1 Project cooperation with Canada⁸ - Broken cold chain simulation at the scale-down level

In an effort to support Food Loss and Waste (FLW) research, Agriculture and Agri-Food Canada (AAFC) recently hired Dr Louis Sasseville as a Research Scientist specifically to work towards modelling FLW in food systems. Dr Sasseville holds a Ph.D. in biophysics from the University of Montreal. After his studies, he worked for more than seven years for the Canadian food industry. He has carried out mandates for clients ranging from small family-owned food processing companies to multinationals. He has notably delivered several projects related to the reduction of food loss and waste by increasing the shelf-life of fresh foods by developing applications for innovative technologies. He has also been involved in R&D projects throughout the value chain (purchasing, quality control, quality assurance, transport and logistics) in the context of the international supply chain. He therefore understands the logistical constraints and the complexity of the international food system. As a research scientist for AAFC since 2021, he applies techniques drawn from modern physics to the study of food, its journey through the food system, and FLW reduction.

Dr Sasseville has joined Dr Sébastien Villeneuve as the co-leader of the project entitled “Implementation of a technology platform to develop sustainable strategies in order to reduce Food Loss and Waste across the continuum of food distribution in Canada” (Figure 15). Activities in that project have been slowed down in 2020 due to COVID-19 pandemic but have fully restarted in 2021. This year, the focus has been put on achieving the first phase of the approach: Pilot scaling (scale-down) of real conditions. Briefly, real condition data used for the simulation come from the database used in conjunction with the CanGRASP simulation tool⁹ (LeBlanc et al. 2015). From this database, a distribution temperature pattern is generated by simulation (of a broken cold chain) for food products located at several locations inside a pallet and this allows determining the sequence of set points at the scale-down level required to mimic the broken cold chain for any specific positions in the pallet (Figure 16). The main advantage of this approach is that any realistic broken cold scenarios can be studied in situ by using a minimum of food products instead of instrumenting a full loaded pallet in a real food supply chain. The approach which is continuously improved shows very encouraging results.

In 2022, Dr Villeneuve and Dr Sasseville will focus on adding the vibration that occurs due to road pavement (ground transportation) and the depressurization environment due to altitude (take-off, in-flight and landing during air transportation) to the approach.

⁸ The following section was written by Dr Sébastien Villeneuve and Dr Louis Sasseville from Saint-Hyacinthe Research and Development Centre in Quebec, Canada.

⁹ • LeBlanc, D.I., Villeneuve, S., Hashemi Beni, L., Otten, A., Fazil, A.M., McKellar, R., & Delaquis, P.J. 2015. [A national produce supply chain database for food safety risk analysis](#), Journal of Food Engineering, 147, p. 24-38.



Figure 15 Dr Sébastien Villeneuve and Dr Louis Sasseville (from left to right) collecting data from the simulation of a broken cold chain at the scale-down level (Photo: Carole McKinnon).

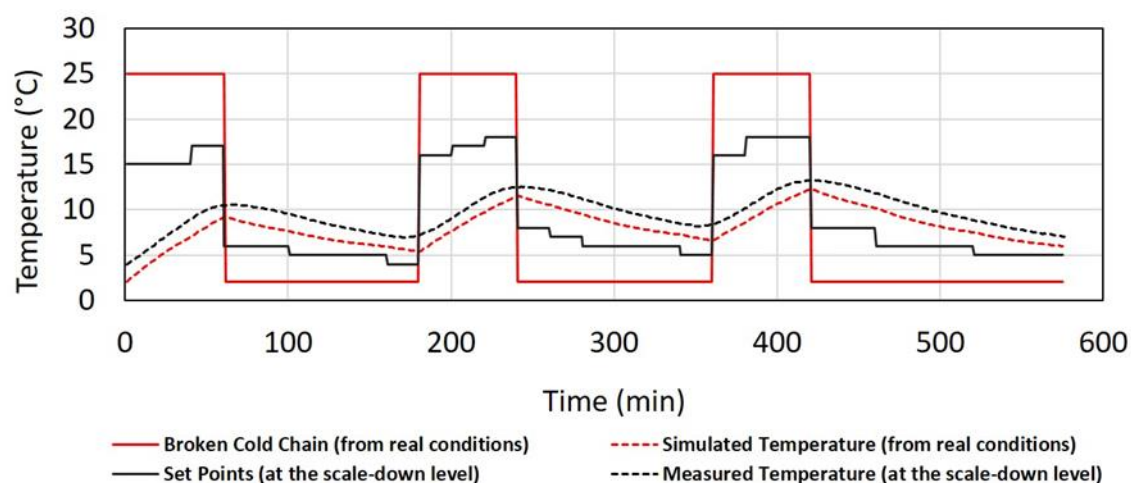


Figure 16 Temperature of a clamshell of fresh cut lettuce inside a pallet during a broken cold chain simulated scenario (From real conditions to the scale-down level) (credit: AAFC).

The Thünen Institute acts as a facilitator for the project results in order to share the findings that could also be useful for other countries within the Initiative's network.

3.3.2 Research cooperation with Spain¹⁰

As announced within our [2020](#) annual report, Héctor Barco Cobalea defended his PhD “Methodology to facilitate the FLW quantification along the agri-food chain and different territorial scales” at the University of Deusto under the external revision of Dr Felicitas Schneider from the Thünen Institute among others. We congratulate Héctor on his success and wish him plenty of interesting FLW projects in the future! This thesis is going to be published on a specific [website](#) of the Ministry of Education of Spain.

Additional cooperations such as advertising the Global FLW expert database were implemented between Héctor and our Collaboration Initiative. This information has been included in a specific course on the subject of food losses and waste, which the Government of the Valencian region will use for training agents in the agri-food chain, starting in January 2022.



Figure 17 Raising awareness towards the Global FLW expert database during a virtual training session for the Valencia region (credit: Héctor Barco Cobalea)

Back in 2011, Dr Sandra Lebersorger and Dr Felicitas Schneider published¹¹ results from a research project highlighting the specific methodological needs of the food waste fraction during household waste composition studies related to proper quantification. The composition analysis protocol created by them was now adapted and used by Maria-Angeles and Héctor to estimate the FLW volumes in different municipalities. In this regard, the protocol was implemented for the characterization of rubbish bags in four different municipalities within the region of Valencia (Spain). These four municipalities have different profiles in relation to the population and the type of habitat (rural or urban). Furthermore, the rubbish bags were collected in specific places according to characteristics such as the case of residence areas, a high concentration of the catering sector or the presence of large supermarkets. Figure 18 provides some insights into the sorted waste. This study is above all pioneering as it is the first to be carried out in the Valencian region. Progress has been made in the real implementation of the measurement protocol and these first conclusions are going to be analysed in order to establish a larger-scale sampling in the coming months.

¹⁰ The chapter (text and figures) was provided by Dr Héctor Barco Cobalea from the University of Deusto and Dr Maria-Angeles Fernandez-Zamudio from Valencian Institute of Agricultural Research (IVIA).

¹¹ Lebersorger S., Schneider F. (2011) Discussion on the methodology for determining food waste in household waste composition studies. Waste Management 31 (2011) 1924-1933, doi:10.1016/j.wasman.2011.05.023.

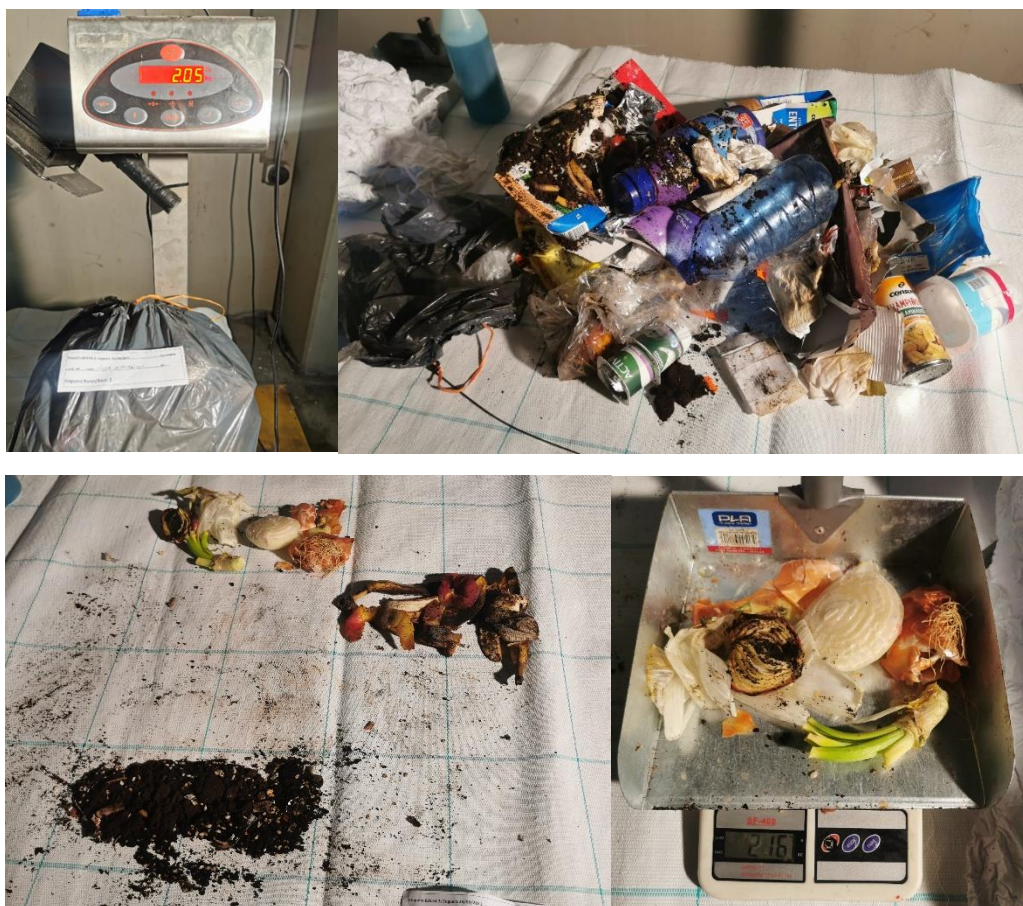


Figure 18 Impressions from the sorting analysis in different Valencian municipalities (photos made by Valoración y Tratamiento de Residuos Urbanos SA (VYTRUSA) and provided by Héctor Barco Cobalea)

Continuing the collaboration on harvest and storage losses of persimmon in the Valencian region, the extension of the previous study analysed data from persimmon losses in the field within a second growing season as well as focussed on the comparison between different quantification methodologies to define the most suitable for quantifying harvest losses. Furthermore, additional economic data was included covering the producer unit costs and costs per hectare, analysing the current situation of economic profitability of farmers. Due to the pandemic, the planned time schedule for publication of the results was prolonged and is expected for early 2022.

3.3.3 Empowering Sri Lanka to address food losses and waste issue¹²

Sri Lanka is a developing country that has been agrarian based for hundreds of years. Presently, agriculture employs approximately 25 % of Sri Lanka's population. The sector contributes 7 % of the nation's gross domestic product and 14 % of the nation's greenhouse gas emissions.

The agriculture sector in Sri Lanka is facing several challenges and food losses and waste is crucial. High qualitative and quantitative postharvest losses in traditional fresh fruit and vegetable supply chains are negatively impacting all stakeholders, from farmers to retailers and consumers. As per statistics, Sri Lanka produces more than 800,000 metric tons of fresh fruits and vegetables annually and approximately 30 - 40 % of them are lost due to postharvest losses.

¹² The text and photos were contributed by Dr Chanjef Chandrakumar from Global Research Alliance on Agricultural Greenhouse Gases - Secretariat, Ministry for Primary Industries, New Zealand.

In that context, the Government of New Zealand has been supporting Sri Lanka to strengthen their research and capacity building efforts, through a pilot study facilitated by the Global Research Alliance on Agricultural Greenhouse Gases (GRA). The project aims to quantify the postharvest losses in the Sri Lankan banana supply chains, estimate the associated greenhouse gas emissions, and subsequently mitigate them. The study is a collaboration between the Ministry of Agriculture/National Institute of Post-Harvest Management and the University of Peradeniya (Figure 19).



Figure 19 Pictures from the field study on Sri Lankan banana supply chains (credit: University of Peradeniya).

The first phase of the pilot study showed that the postharvest losses from harvesting to retail outlet segments are approximately 30%, with the highest contribution from the plantation-related stages, followed by transportation stages from farm gate to collector, and collector to wholesaler. Presently, the second phase is underway which is looking at the mitigation options to address the losses and waste.

The outcomes of this pilot study were disseminated at various conferences¹³/workshops and via research publications. Among others, the FLW [workshop](#) “Exploring the opportunities and challenges in addressing food losses and waste in Sri Lanka and their climate change impacts” was organised by GRA where the project results were presented to an international auditorium. The study also received technical expertise from German and New Zealand experts, including Dr Ian Ferguson, Dr Chanjef Chandrakumar and Dr Felicitas Schneider.

At present, conversations are underway between the Thünen Institute and Sri Lankan universities and research institutions, to design and implement an expansive research and capability building programme to quantify and reduce food wastes in multiple fresh fruit and vegetable supply chains in Sri Lanka.

3.3.4 Cooperation with the H2020 LOWINFOOD Consortium on innovations against food loss and waste¹⁴

In the effort to meet the SDG 12.3 on the reduction of food loss and waste, the European Union has financed several projects aiming to identify, validate and demonstrate innovative, effective ways to reduce food losses

¹³ E.g. Kamalakkannan S., Wasala W.M.C.B., Kulatunga A.K., Gunawardena C.R., Bandara D.M.S.P., Jayawardane J.L., Rathnayake R.M.R.N.K., Wijewardana R.M.N.A., Weerakkody W.A.P., Ferguson I., Chandrakumar C. (under review) Application of Life Cycle Thinking Towards Addressing Food Losses and Climate Change Impacts: Case of Banana Postharvest Losses in Sri Lanka, 29th CIRP Life Cycle Engineering Conference, 4-6 April 2022, Leuven, Belgium.

¹⁴ This section (text and logo) was kindly prepared by Dr Clara Cicatiello from University Tuscia.

and waste all along the food supply chain. Felicitas Schneider from the Thünen Institute is on the External Advisory Board of one of these projects, [LOWINFOOD](#), which started on November 1st, 2020, and is due to finish in 2025.

LOWINFOOD is an innovation action aiming to co-design, together with actors of the food chain, low-waste value chains by supporting the demonstration of a portfolio of innovations. The value chains concerned are those particularly affected by food loss and waste, due to the perishable nature of the products: fruits & vegetables, bakery products and fish value chains, as well as products wasted by consumers, either at home or out of home.



Figure 20 Logo of the H2020 project LOWINFOOD indicating the focus value chains of the project (logo: LOWINFOOD)

Diverse forms of innovation are considered in this process, including technological, social and organizational innovations, that allow the food chain actors to better organize and coordinate their activities, and to remove risk factors for the generation of food loss and waste at different levels. The focus of these innovations is on the top levels of the food waste hierarchy, dealing with food loss and waste prevention and, in some cases, with the reuse of food in a circular approach.

The project activities are structured upon a set of demonstration settings where the innovations are implemented and assessed. One of the key features of LOWINFOOD, to which the experts of the External Advisory Board have given their contribution, is the multi-actor approach that has been followed to identify the methodological framework for such evaluation. This framework is built upon three pillars: for each innovation, its efficacy in preventing and reducing food loss and waste (with respect to a baseline) will be assessed, along with the environmental and socio-economic impacts on the value chain actors involved.

3.3.5 Cooperation with Austrian Armed Forces – Conference and implementation project Smart Waste¹⁵

The Austrian Armed Forces, together with the Thünen Institute, held a conference on the topic of "Smart Waste" at the Schwarzenberg barracks on September 2nd, 2021 in Salzburg (Figure 21).

¹⁵ This text and logo were kindly provided by Dr Rupert Fritzenwallner from Austrian Armed Forces.

The aim was to discuss the ideas for implementing the EU's Delegated Decision on the reduction of food waste within army canteens among experts from various disciplines and to agree on alternative courses of action. The topics of sustainability and digitalisation on the one hand and economic efficiency on the other in relation to food waste prevention were examined from different perspectives in an interdisciplinary manner.

Based on the fundamentals of the Green Deal, the state of science and the requirements of the Austrian Federal Armed Forces, practical approaches through the Internet of Things and the energy-efficient Long Rang Wide Area Network were presented to the participants. In addition to a supplier, the University of the Federal Armed Forces in Munich gave a presentation on security and technological aspects.



Figure 21 Logo of the Smart Waste Conference (credit: Austrian Armed Forces Dion6/BauW)

The feedback on the event and the measures taken in the meantime show that there is a need for up-to-date information. The conference proceedings will be published at the beginning of 2022 and can be requested from the conference chairperson, Dr Rupert Fritzenwallner from the ICT & Cyber Directorate in the Austrian Federal Armed Forces.

In the course of the panel discussion, community caterers, waste disposers and scientists discussed the various aspects. In the meantime, the implementation of a pilot project has been started and further use cases for sustainability through the Internet of Things and digitalisation are being realised.

3.3.6 Doctoral thesis on household food waste in Zimbabwe

We proudly announce that Ms. Sharon Mada was selected for a scholarship by the Catholic Academic Exchange Service (KAAD). Her doctoral thesis will include a close look into the determinants of food waste in low-income households in Harare. Martin Banse, the Head of the Thünen Institute of Market Analysis, will act as supervisor and Felicitas will support her with details. We congratulate Sharon on her successful application! After a half-year German language course she will start her study at the Georg-August University Göttingen in the Faculty of Agricultural Sciences in autumn 2022.

3.4 Topic 4: Matching ideas & funding

3.4.1 German Chancellor Fellowship for Prospective Leaders

Again in 2022, the Alexander von Humboldt Foundation will launch the “German Chancellor Fellowship for Prospective Leaders” for applicants from Brazil, China, India, Russia, the US and South Africa! Each year, up to ten winners from each country are selected to carry out their individual projects for one year in Germany. The subjects of the projects are not restricted to a special topic but they should have societal relevance with respect to politics, economy, media, society, culture or administration. The fellows act as a link between Germany and their home country. The Alexander von Humboldt Foundation pays a monthly grant, helps with administrative

issues during their stay and offers additional excursions and courses for the selected “prospective leaders” of the program. The German host organisation receives a monthly financial support for its expenses.

The next round of application starts on March 15th, 2022. More information on the program is provided [online](#). If you have any ideas related to FLW, please do not hesitate to contact us!

3.4.2 Government of Canada launches Food Waste Reduction Challenge

Beside the cooperation between the Thünen Institute and Agriculture and Agri-Food Canada¹⁶, more activities are going on in Canada which should be shared among our network. As reported in our 2020 report, Agriculture and Agri-Food Canada (AAFC) has launched the \$20M Food Waste Reduction Challenge to accelerate the development and deployment of innovative solutions that can tackle food waste at any point from farm-to-plate. Although all four complementary innovation streams are already closed for application, it is still interesting to stay connected.

Challenge Streams A and B support solutions that are ready for commercialisation and that provide an innovative way of doing business (i.e., a new business model) to prevent or divert FW across any or multiple segments of the food supply chain. These streams target solutions in their early commercialisation phase to accelerate their growth and expansion in the Canadian market. Successful solutions will have a high impact in reducing the volume of food waste in absolute (total volume of food saved) or relative terms (percentage of food saved).

Challenge Streams C and D focus on investments in technologies at the prototyping and testing phases to improve their effectiveness and make them ready for the Canadian market within the next two years.

You can find the selected semi-finalists [here](#) who entered the third stage of the challenge. They have “one year to accelerate and scale up the commercialization of their solution by acquiring new customers or users and growing their presence in Canada. Participants will be required to rigorously test and evaluate the effectiveness of their solution and report on their results.” More information about the Food Waste Reduction Challenge and the exciting developments is available at the challenge’s [website](#).

3.4.3 Food Coalition – A COVID-19 response

There was a new voluntary global alliance formed on proposal of the Italian government which is open to all stakeholders interested in specific food systems transformation as response to COVID-19. Under FAO leadership the focus is to support “global, coordinated action to safeguard food security and nutrition and promote sustainable agri-food system transformation.” In September 2021, the first call for proposals targeted the following priorities:

- global humanitarian response plan
- economic inclusion and social protection to reduce poverty
- reduction of food loss and waste
- food systems transformation

Please see the [Food Coalition website](#) for further information (including membership) and details on funding opportunities.

¹⁶ See section 3.3.1 of the present report.

3.5 Topic 5: Fostering cooperation at implementation level

3.5.1 Cooperation with national and international standardisation organisations

On initiative of the Danish Standards, the new subcommittee ISO/TC 34/SC 20 Food Loss and Waste was introduced at International Organisation for Standardisation (ISO). The kick-off meeting was scheduled on December 15th 2021 while some other national mirror committees had national meetings already prior to the international one. In Germany, the national standardisation organisation (DIN) invited stakeholders along the entire food supply chain for a brainstorming and information exchange workshop in September 2021. There, potential standardisation needs were raised and discussed. The official DIN working group addressing the topic as of now is “NA 057-02-02 AA food safety – management systems” which will serve as national mirror group. Our coordinator Felicitas attended the meeting of the national group in October and was elected to represent German head of delegation within the ISO committee. We are looking forward to a fruitful exchange with international and national colleagues.

3.5.2 Cooperation with United Nations Environment Program (UNEP)

In line with our ongoing cooperation with the UNEP related to our annual regional FLW workshops since 2019, the Thünen Institute also supports the elaboration of the Food Waste Index quantification methodology. In order to track progress towards the quantitative goal of SDG 12.3, to halve per capita food waste at retail and consumer levels, UNEP is the custodian of the SDG indicator 12.3.1b, the Food Waste Index.

Our coordinator Felicitas was part of a reviewer team providing feedback on the draft report. The finalised Food Waste Index methodology is available [here](#).

Furthermore, Felicitas is invited to support the UNEP Africa Food Waste Working Group which is one of four Regional Food Waste Working Groups aiming to support middle- and lower-income countries in measuring and reducing FW at retail and consumer level.

3.6 Recent literature from Initiative participants

In this section, we introduce 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!

- Al-Khateeb S.A., Hussain A., Lange S., Almutari M.M., Schneider F. (2021) Battling Food Losses and Waste in Saudi Arabia: Mobilizing Regional Efforts and Blending Indigenous Knowledge to Address Global Food Security Challenges. Sustainability 2021, 13, 8402. <https://doi.org/10.3390/su13158402>.
- Giordano, C., Graziano, P., Lazzarini, M., Piras, S., & Spaghi, S. (2021). Sustainable Community Movement Organisations and household food waste: The missing link in urban food policies? Cities, 103473. <https://doi.org/10.1016/j.cities.2021.103473>
- Goossens, Yanne; Kuntscher, Manuela; Lehn, Friederike; Schmidt, Thomas (2021) Sustainability assessment of food waste reduction measures. Braunschweig: Johann Heinrich von Thünen-Institut, 2 p, Project brief, [DOI:10.3220/PB1626851783000](https://doi.org/10.3220/PB1626851783000)
- Leverenz D., Schneider F., Schmidt T., Hafner G., Nevárez Z., Kranert M. (2021) Food Waste Generation in Germany in the Scope of European Legal Requirements for Monitoring and Reporting. Sustainability 2021, 13, 6616. <https://doi.org/10.3390/su13126616>.
- Muñoz Ureña H.A. (2021) [Avances legislativos sobre prevención y reducción de pérdidas y desperdicios de alimentos en América Latina y el Caribe](#) (Legislative developments on food loss and waste prevention and reduction in Latin America and the Caribbean). FAO Estudio Legislativo N.o 116. Roma, FAO.

- Marques Vieira, L.; Dutra De Barcellos, M.; Porpino De Araujo, G.; Eckert Matzembacher, D. (2021) [Abordagens metodológicas para enfrentar o desperdício de alimentos: Avançando a agenda](#). RAE-Revista de Administração de Empresas, [S. l.], v. 61, n. 5, p. 1–7, 2021. DOI: 10.1590/S0034-759020210509.
- Okayama T., Watanabe K., Yamakawa H. (2021) Sorting Analysis of Household Food Waste - Development of a Methodology Compatible with the Aims of SDG12.3. Sustainability 2021, 13, 8576. <https://doi.org/10.3390/su13158576>.
- Schmidt TG, Orr L (2021) Monitoring food waste in the wholesale and retail sector in Germany 2019: Food retail data. Braunschweig: Johann Heinrich von Thünen-Institut, 29 p, Thünen Working Paper 168a, [DOI:10.3220/WP1613555002000](https://doi.org/10.3220/WP1613555002000).
- Thies AJ, Schneider F, Efken J (2021) The meat we do not eat. A survey of meat waste in German hospitality and food service businesses. Sustainability 13(9):5059, [DOI:10.3390/su13095059](https://doi.org/10.3390/su13095059).
- Vittuari, Matteo; Masotti, Matteo; Iori, Elisa; Falasconi, Luca; Gallina Toschi, Tullia; Segrè, Andrea (2021) Does the COVID-19 external shock matter on household food waste? The impact of social distancing measures during the lockdown. Resources Conservation and Recycling, 2021, 174, pp. 1 – 11, <https://doi.org/10.1016/j.resconrec.2021.105815>.
- WWF (2021) [Driven to waste: the global impact of food loss and waste on farms](#). WWF-UK and Tesco partnership, technical report, 145 pages.
- Yigezu Y.A., Moustafa M.A., Mohiy M.M., Ibrahim S.E., Ghanem W.M., Niane A.-A., Abbas E., Sabry S.R.S., Halila H. (2021) Food Losses and Wastage along the Wheat Value Chain in Egypt and Their Implications on Food and Energy Security, Natural Resources, and the Environment. Sustainability 2021, 13, 10011. <https://doi.org/10.3390/su131810011>.

3.7 International news

- Some years ago, the Economist Intelligence Unit developed [The Food Sustainability Index](#) (FSI) together with the Barilla Center for Food and Nutrition. The index examines how food systems are performing across food loss and waste, sustainable agriculture, and nutritional challenges. A set of indicators and sub-indicators address selected societal, environmental and economic topics. Our coordinator Felicitas is one of the interviewed experts in the most recent report “[Fixing Food 2021 - An opportunity for G20 countries to lead the way](#)”. It focuses on the analysis of the G20's performance on these three pillars and further investigates the opportunities for G20 to drive change on food sustainability.
- Food and Agriculture Organisation (FAO) offers a wide range of FLW information on the dedicated Technical Platform on the Measurement and Reduction of Food Loss and Waste. You can find a lot of background information, join the Community of Practice or have a look at the forthcoming as well as upcoming events [there](#)!
- In early 2021, ReFED launched the [ReFED Insights Engine](#) which provides valuable information on food waste generation in the USA, solutions, solution providers as well as solution impacts. Together with the [Roadmap to 2030](#) the engine is a useful tool for US stakeholders to explore priorities or how to take action in efficient and effective manner.
- One of the highlight events of 2021 was the United Nations Food Systems Summit which finally took place on September 23rd 2021 in New York. There were several pre-summit events (such as that introduced in section 3.2.3) organised by different nations and organisations. Food loss and waste was especially addressed in action track 2 “Shift to sustainable consumption patterns”. For results and further information please see the official [website](#) of the UNFSS 2021.



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