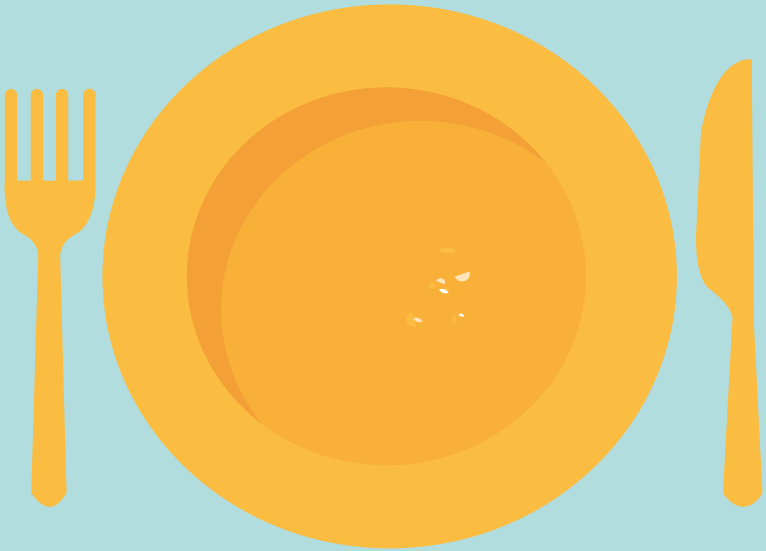
ETH zürich



Food Day @ETH 2022 Proceedings

11 November 2022

14:30 – 21:00 CET, ETH Zurich

World Food System Center

ETH Zurich established the World Food System Center in 2011. Our mission is to be a leader in scientific research, education, and outreach across the food system that contributes to the key challenges of food and nutrition security, environmental health, and social well-being.

Food Systems and the Sustainable Development Goals

In the coming decades, the world food system will face unprecedented challenges in its ability to feed and nourish the world. Fighting hunger was therefore included as a central element in the United Nations (UN) Sustainable Development Goals (SDGs) and part of the 2030 Agenda for Sustainable Development to build a better world. The 2030 Agenda calls upon all states, including Switzerland, to implement the SDGs by working together with business, NGOs, governments, academia, the UN, and other actors. However, the challenges to ending hunger and food insecurity keep growing. The COVID-19 pandemic, extreme climate events and ongoing conflicts have highlighted the fragilities in our food systems and the inequalities in our societies.

The Center

The World Food System Center was established at ETH Zürich based on the understanding that solutions to food system challenges require collaboration from stakeholders across the entire food value chain. Science its founding in 2021, the programs of the Center bring opportunities to students, scientists, and professors who are concerned with food systems in their research and studies. Providing interactive platforms to engage with a wide range of local to global stakeholders from different sectors and disciplines is key.

Our annual research symposium brings together a diverse audience from academia, industry, government and international organisations for interactive discussions and workshops on food system related research and innovation. At this year`s edition, we look back on 10+ years of food systems research, education, and dialogue facilitated by the Center. And we also discuss challenges and opportunities that are still ahead of us to transform global food systems to become economically, socially, and environmentally sustainable.

Follow us on:

@ethzWFSC World Food System Center, ETH Zurich

Program

14:30 – 16:30 Thematic Workshops

› Future proteins for sustainable food systems
› Science communication for #changemakers
› Community building for food system leaders

16:30 – 17:15 Break and Poster Session

17:15 – 19:15 Plenary Session

Welcome and introduction
› **Martijn Sonnevelt**, World Food System Center (WFSC) Executive Director

10+ years of collaboration: highlights, key achievements, and way forward
› **Robert Finger**, Professor of Agricultural Economics and Policy & WFSC Chair

Role of competence centers and the WFSC for ETH Zurich
› **Vanessa Wood**, Vice President of Knowledge Transfer and Corporate Relations, ETH Zurich

Keynote: Research priorities for a changing future food system
› **Dominique Burgeon**, Director, FAO Liaison Office with the United Nations Office in Geneva

Panel Discussion: What transformation is needed to make our food system future fit?
Panelists:

› **Erika S. Georget**, Head of Bioprocessing at Bühler AG & Joint Managing Director of Eridia
› **Christian Hofer**, Director of the Swiss Federal Office for Agriculture
› **Eva-Marie Meemken**, Professor of Food Systems Economics and Policy at ETH Zurich
› **Denise Rotondo**, Partner Engagement Lead, Centre for Nature and Climate, World Economic Forum
› **Emma Wetter-Slack**, Professor of Mucosal Immunology at ETH Zurich & WFSC Vice Chair

› Moderation: **Jeanne Tomaszewski**, World Food System Center Communications Manager

19:15 – 21:00 Networking Poster Session with Reception

Workshops

Future proteins for sustainable food systems

The protein sector is in the midst of rapid development. There is a need to accelerate the diversification of protein sources that are sustainable, scalable, and benefit consumers health. In this workshop, we will hear from ETH Zurich scientists and start-ups about new innovative approaches in the future protein sector. Participants will also have the opportunity to discuss and share their views on some of the most pressing challenges.

Speakers: Ashley Green, Mingqin Li, Tobias Kistler, Eliana Zamprogna, Tomas Turner, Fabienne Michel

In collaboration with the Swiss Food and Nutrition Valley

Science communication for #changemakers

For change to occur, researchers need their results to be put into practice. We will begin the workshop by focusing on what you, as a scientist, want to say. Communication specialist Helga Rietz from the ETH Zurich AI Center joins us to introduce opinionated writing, what it is, and the need for it to communicate science for change. ETH scientist Robert Huber will share his own experiences as a #ScienceTwitter user and frequent blog writer. Join us to try your hand at science communication for change.

Speakers: Helga Rietz, Robert Huber

In collaboration with the ETH AI Center

Community building for food system leaders

Dive into the process of community building during this workshop. We will explore the case study of the World Food System Center alumni network (WFSN). We will share steps that have been taken to develop and grow this community, and we will discuss what worked well and what we learned along the journey. You will receive tools to start and strengthen your own community. And, of course, learn how to join our very active WFSN community of change makers in the food system!

In collaboration with the World Food Center Alumni Network (WFSN)

Speakers

Presenters

Martijn Sonnevelt

WFSC Executive Director

Robert Finger

Professor of Agricultural Economics and Policy & WFSC Chair

Vanessa Wood

Vice President of Knowledge Transfer and Corporate Relations, ETH Zurich

Panelists

Erika S. Georget

Head of Bioprocessing at Bühler AG & Joint Managing Director of Eridia GmbH

Christian Hofer

Director of the Swiss Federal Office for Agriculture

Eva-Marie Meemken

Professor of Food Systems Economics and Policy at ETH Zurich

Keynote

Dominique Burgeon

Director, FAO Liaison Office with the United Nations Office in Geneva

Research priorities for a changing future food system

Mr. Dominique Burgeon is the Director of the Food and Agriculture Organization (FAO) Liaison Office with the United Nations in Geneva since January 2021. Before, Mr. Burgeon was Director of FAO's Emergency and Rehabilitation Division for almost 10 years. During this time he was also designated Strategic Programme Leader, Resilience.

With more than two decades of professional experience and different management positions at FAO, Mr. Burgeon has extensive experience in humanitarian and development assistance.

Mr. Dominique Burgeon holds a M.Sc. in Agricultural Engineering from the State University of Gembloux and a Post Graduate Diploma in International Relations and European Integration from the State University of Liège, Faculty of Law, in Belgium.

Moderator

Denise Rotondo

Partner Engagement Lead, Centre for Nature and Climate, World Economic Forum

Emma Wetter-Slack

Professor of Mucosal Immunology at ETH Zurich & WFSC Vice Chair

Jeanne Tomazewski

WFSC Communications Manager

Networking Poster Session

Friday, 11 November, 16:30 – 17:15 and 19:15 – 21:00 CET

Since 2016, the Food Day @ETH Networking Poster Session is an open and appreciated way for researchers from across departments and institutions to come together and exchange. It enhances the visibility of ongoing food system related research and gives scientists the opportunity to network and exchange ideas with other research groups, industry partner and guests. Matching this year's Keynote from Dr. Ismahane Elouafi, Chef Scientist at UN Food and Agriculture Organization, all displayed posters highlight how research at ETH Zurich and partner institutions contributes to creating a more sustainable food system.

During the two poster sessions, the authors will stand by their posters and be available to answer questions and discuss their work. Presentations will be informal in nature, and attendees are welcome to walk around and familiarize themselves with the topics being presented. At the end of the Food Day @ETH three posters will be awarded with poster prizes, based on attendee voting.

Poster Abstracts

Poster 01: Understanding drivers and origins of nitrous oxide fluxes in agroecosystems

Authors: F. Turco, F. Liebisch, J. Mohn, N. Buchmann

Affiliations: Grassland Sciences Group, ETH Zurich; Agroecology and Environment, Agroscope; Laboratory for Air Pollution & Environmental Technology, Empa

Contribution to Sustainable Food Systems: By improving understanding of the drivers and origins of N2O emissions from cropland, the project aims to develop N management recommendations that can mitigate N2O emissions. The ultimate goal is to reduce the greenhouse gas footprint of crop production.

Abstract: Nitrous oxide (N2O) emissions from agricultural soils contribute significantly to global warming and ozone depletion. N fertilization is widely recognized as the leading driver of N2O emissions from agricultural soils. Consequently, there is a pressing need to identify climatesmart strategies that can reduce soil N losses by improving the efficiency of N fertilization and thus reducing N surplus, particularly in croplands. Precision N-fertilization is considered a promising strategy, but its potential for N2O mitigation in real-world settings is still unclear and requires further investigation. Thus, the overarching goals of the DONA project (**D**rivers & **O**rigins of **N**itrous oxide fluxes in **A**groecosystems) are to provide a deeper understanding of drivers and origins of N2O losses from cropland to the atmosphere and to identify the best N management options for climate-smart agriculture.

Poster 02: Can organic farming practices increase nitrogen (N) use efficiency and decrease N losses in tea plantations in Sri Lanka?

Authors: M. Chiewattanakul, S. Rathnayaka, J. Balasubramaniyam, D. Amarasena, A. Oberson, K. Mohotti, J. Mohotti, E. Frossard

Affiliations: Plant Nutrition Group, ETH Zurich; University of Peradeniya, Sri Lanka; Tea Research Institute of Sri Lanka

Contribution to Sustainable Food Systems: This research contributes to SDG1 – improved farmer income; SDG3 – improved health through better N management; SDG6 – decreased nitrate contamination in water; SDG12 – recycling of organic wastes; SDG13 and SDG15 – decreased greenhouse gas and ammonia emissions.

Abstract: Nitrogen (N) plays a vital role in food production, yet its oversupply presents a critical threat to the environment and human health. Navigating this balance is particularly crucial for leaf crops of socio-economic importance, like tea. As the second most consumed beverage globally, growers apply excess mineral N fertilisers for increased yields, unaware of possible extensive N losses. While many have resorted to organic practices, significant limitations remain in our knowledge of N dynamics in tea cultivation systems. Our research aims to assess whether implementing organic practices can improve N use efficiency and decrease N losses by tea cultivation systems – without compromising yield and quality. The sources, uptake and use of N by tea plants are investigated in a long-term trial in Sri Lanka, comparing conventional and organic systems. Ultimately, we hope to deliver science-based understanding to stakeholders for improved N use efficiency – and contribute towards more sustainable food production.

Poster 03: N nutrition, pedoclimatic limitations and crop management techniques for paddy rice (*Oryza sativa* subsp. *japonica*) grown north of the Swiss Alps

Authors: L. Freund, E. Frossard, T. Guillaume

Affiliations: Agroscope; Plant Nutrition Group, ETH Zurich

Contribution to Sustainable Food Systems: We aim to determine the feasibility of rice cropping in our regions, to value the frequently flooded agricultural zones to maintain agricultural production, to reduce soil organic matter degradation and to create niche habitats for endangered animal and plant species.

Abstract: The Swiss paddy rice project started 5 years ago is developing in five cantons north of the Swiss Alps. As the local rice cultivation is at its beginning, there is a necessity to determine the pedoclimatic limitations for rice growth and yield, to study the influence of the producer's crop management techniques and to study the effects of reducing conditions of a flooded crop on the N cycle. Once identified, it will be then possible to determine if they are mitigable and the feasibility of the rice culture. Other experiments will aim to create tools to determine at which plant phenological stage the fertilizer application is the most efficient, also to determine the important parameters driving the plant N uptake originated organic or mineral fertilizer. Thus, this project could help to determine if the rice will remain a niche production or if it can become a significant culture for farmers.

Poster 04: From current to deliberative diets: Modelling nutritional and environmental effects of the Swiss food system

Authors: E. Augustiny, A. Frehner, A. Green, A. Müller, A. Mathys

Affiliations: Sustainable Food Processing Laboratory, ETH Zurich; Research Institute of Organic Agriculture (FiBL), Frick

Contribution to Sustainable Food Systems: This project aims to improve assessments of the environmental and nutritional effects of the Swiss food system. It further incorporates a citizen participatory approach to find solutions for transitioning to a more sustainable Swiss food system.

Abstract: Food systems cause major threats to the environment, such as biodiversity loss and emitting greenhouse gases. To reach the Sustainable Development Goals (SDG) as stated by the UN, a transformation of the agri-food sector is inevitable. Suitable methods to analyse present and future scenarios are needed and collaborative and transdisciplinary efforts are required. This doctoral project aims to further develop a food system model to include the underrepresented impacts on biodiversity and to model environmental and nutritional effects of the Swiss food system simultaneously. Within a participatory process, including deliberation workshops with citizens, this model will then be used as a decision support instrument to analyse and discuss scenarios and visions for the Swiss food system. Through this approach new insights into the sustainability performance of the Swiss food system and viable options for its transformation will be gained, resulting in science-based policy recommendations co-created with stakeholders.

Poster 05: Characterization of the diurnal pattern of breath metabolome and enteric methane emissions in dairy cows

Authors: M. Z. Islam, S. Giannoukos, S. Räisänen, Y. Li, F. Wahl, R. Zenobi, M. Niu

Affiliations: Animal Nutrition Group, ETH Zurich; Analytical Chemistry Group, ETH Zurich; Food Microbial Systems Research Division, Agroscope

Contribution to Sustainable Food Systems: Sustainable animal agriculture demands better feed efficiency and reduced environmental impact. The key to achieving this is to assess rumen fermentation. We aim to develop a novel non-invasive approach through breath metabolome to better understand ruminal fermentation in animal studies.

Abstract: Exhaled breath contains hundreds of volatile organic compounds and can reflect animal physiological processes. We aim to assess the breath metabolome of dairy cows and characterize their diurnal patterns of rumen fermentation and enteric methane emissions. Enteric methane emissions of 7 lactating cows were measured 8 times over 2 consecutive days using a head chamber system to represent every 3 hours of a day. Simultaneously, exhaled breath samples were collected. Breath samples were analyzed using secondary electrospray ionization high-resolution mass spectrometry. The mass spectra obtained were processed in Matlab, and tentative volatile fatty acids (VFA) were annotated using their extract m/z ratio. The intensity of short-chain VFA (i.e., acetate, propionate, butyrate) increased immediately after feeding and followed a similar pattern also observed for methane emissions. The initial results from the present study revealed a great potential to assess rumen fermentation and health in a non-invasive approach to improve animal welfare.

Poster 06: The role of plant diversity in arthropod biodiversity enhancement across field and local scales: Toward a sustainable food systems

Authors: M. Yousefi, A. Dray, J. Six, J. Ghazoul

Affiliations: Ecosystem Management Group, ETH Zurich

Contribution to Sustainable Food Systems: Based on a comparative meta-analysis of 398 experiments in 44 articles, we investigated the contribution of intercropping and Agri-environmental schemes to farm arthropod abundance. This study increases our understanding of how the food system drives biodiversity structure across field and local scales.

Abstract: Based on a comparative meta-analysis of 398 experiments in 44 articles, we aimed to investigate the contribution of intercropping at field scale and Agri-environmental scheme at local scale to farm arthropod abundance and to bring into light the role of 10 key factors driving the effectiveness of plant diversity.The results showed that field intercropping was a promising pest management strategy in maize fields using both legume and non-legume companion crops, but it was not effective in wheat fields. At local scales, flower strips more than 10 meters width do not significantly change the abundance of natural enemies compared to hedgerows and grassy margins. Our results suggested that toward a sustainable food system the response of arthropod abundance to plant diversity is a compromise between four key factors, including scale, arthropod traits, plant diversity and environmental condition.

Poster 07: Biosphere monitoring in agricultural ecosystems with drone-based eDNA surveys

Authors: E. Aucone, S. Kirchgeorg, S. Mintchev

Affiliations: Environmental Robotics Lab, ETH Zurich; Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)

Contribution to Sustainable Food Systems: The combination of robotics and genetics offers a solution for the rapid, cost-effective, and scalable monitoring of biodiversity, enabling the collection of actionable data for sustainable agricultural practices (SDG2) and the protection and restoration of terrestrial ecosystems (SDG15).

Abstract: Growing pressure from biodiversity loss and invasive alien species threatens food security and urgently calls for efficient solutions to monitor the biosphere. We develop robotic methods to automate the collection of the genetic traces that organisms leave behind in the environment, the so-called environmental DNA. Using drones to gently "rub" vegetation, eDNA is collected and then processed to identify the originating species. We proved that drones can successfully collect eDNA from tree branches, and we are extending our approach to survey agricultural ecosystems. We foresee that this new paradigm of robotic biomonitoring can provide actionable data for more suitable agricultural production, enabling early detection of invasive species, near real-time monitoring of biocontrol treatments, and biodiversity monitoring on different spatial and temporal scales.

Poster 08: Agricultural landscapes provide multiple functions – but how to assess them to support policy making?

Authors: A. Heidenreich, A. Muller, C. Pfeifer, J. Six, M. Stolze

Affiliations: Research Institute of Organic Agriculture (FiBL), Frick; Sustainable Agroecosystems Group, ETH Zurich

Contribution to Sustainable Food Systems: Agricultural landscapes provide several services and functions. Recognizing that we must not only focus on efficient food production, but optimally manage the various trade-offs and synergies between the different functions is key and our contribution to a sustainable food system.

Abstract: Agricultural landscapes are multifunctional, closely connected to the much larger food system. We undertook a systematic literature review to explore, which landscape functions were commonly considered in spatially explicit agricultural landscape models. Furthermore, we investigated how the linkages to the wider food systems were captured, and how the gaps in the existing modelling approaches might be addressed. For this, we identified key elements for policy-relevant agricultural landscape assessments and reviewed the publications with respect to these key elements. We found that designing policies for sustainable agricultural land management based on existing models might overlook trade-offs and synergies between landscape functions. However, if scenarios and models are unable to reflect variations in relevant driving factors and food system linkages, studies might consequently misidentify the levers for change and fail to show decision-makers the full scope for action to support the transformation of the food system.

Poster 09: Diverse decision space of sourcing agricultural bioenergy without land use

Authors: F. Wu, S. Pfenningerb, A. Müller

Affiliations: Climate Policy Lab, ETH Zurich; Policy and Management (TPM), Delft University of Technology, Delft, The Netherlands; Research Institute of Organic Agriculture (FiBL), Frick

Contribution to Sustainable Food Systems: Our study contributes to sustainable food and clean energy systems (SDG 15) by modelling the diverse decision space of sourcing ancillary bioenergy without land use at all.

Abstract: Bioenergy receives massive subsidies and is envisioned to play an important role in providing negative emissions, predominantly using dedicated energy crops. However, dedicated biomass is controversial as it may compete with food production and biodiversity protection. On the one hand, there is a less controversial alternative – ancillary biomass not primarily grown for energy and without land/food/feed competition. On the other hand, its potential may considerably vary when different future agricultural practices are in place (e.g., organic farming and waste reduction). Using the food system model SOLm, we explore how changing agricultural practices would affect the future global potential of ancillary biomass. We find that a similar range of biomass potential can be derived from very different mixes of agricultural practices, thus, with different impacts on the food system. Our study reveals the diversified decision space between sustainable food and clean energy systems using zero-land-use ancillary biomass

Poster 10: The effect of organic farming on grassland ecosystem services

Authors: V. H. Klaus, F. Richter, N. Buchmann, N. El Benni, P. Jan, M. Hartmann, M. Suter, A. Lüscher

Affiliations: Grassland Sciences, ETH Zurich; Forage Production and Grassland Systems, Agroscope, Reckenholz; Research Division Competitiveness and System Evaluation, Agroscope, Tänikon; Sustainable Agroecosystems Group, ETH Zurich

Contribution to Sustainable Food Systems: Ecosystem services are closely linked to the SDGs. Agricultural management and respective policies such as agri-environmental schemes can strongly affect grassland ecosystem services and the sustainability of this food system. We studied this in about 90 grasslands in Solothurn, Switzerland.

Abstract: Sustainable agriculture delivers provisioning ecosystem services, i.e., market goods, as well as public services and non-market goods available to the whole society. Agricultural intensification, however, undermines many public ecosystem services. Organic farming can potentially decrease the environmental impact of intensive food production and might therefore be able to sustain both provisioning and public services. However, this has never been comprehensively tested for permanent grasslands. In the project ServiceGrass, in 92 grasslands in the canton of Solothurn, we measured the effects of organic farming on more than 20 ecosystem functions that translate into ecosystem services. Results indicate only few positive effects of organic farming on public ecosystem services. Yet, we also didn't find significantly reduced provisioning of (organic) grassland yield. Therefore, we conclude that organic farming only marginally affects permanent grassland ecosystem services in this region, which has relatively low animal densities, potentially restricting high-intensity grassland farming in both farming systems.

Poster 11: Boosting legume breeding in Switzerland

Authors: C. Oppliger, B. Keller, A. Walter

Affiliations: Crop Sciences Group, ETH Zurich

Contribution to Sustainable Food Systems: Peas and other legumes can fix atmospheric nitrogen through a symbiosis with bacteria. Thus, they do not require additional N-fertiliser and contribute to a sustainable agriculture (SDG 2). With my project I support the breeding of site-adapted pea varieties in Switzerland.

Abstract: The demand for vegetable proteins in Switzerland is increasing. Pea production has been neglected in Switzerland, despite some use as fodder, and adapted varieties are missing. For human consumption, peas need not only to meet agronomic requirements and being able to cope with changing climate conditions, but also fulfil quality criteria for the food industry. Therefore, an evaluation and selection of well adapted varieties is required. To support this breeding process, high throughput field phenotyping (HTFP) methods allow efficient selection among many breeding lines. At the research site in Eschikon, the Group of Crop Science uses various image processing methods to analyse the performance of different varieties. The focus in image processing lies on early vigour, flowering, senescence as well as stress tolerance to environmental factors. Findings on the growth dynamics of the crops will provide insights into the protein development and adapted varieties which strengthen the local value chains will be identified.

Poster 12: Environmental impacts and nutritional compositions of plant-based beverages compared to cow's milk: A sustainability assessment

Authors: A. Green, T. Nemecek, B. Walther, A. Mathys

Affiliations: Sustainable Food Processing Laboratory, ETH Zurich; Life cycle assessment group, Agroscope; Human nutrition group, Agroscope

Contribution to Sustainable Food Systems: This research supports future sustainability foods systems and SDGs 3, 12, 13, 15, by including nutritional and environmental sustainability domains, of future foods, to avoid burden shifting. In this case, we aim to optimize environmental impacts without compromising nutrition/health.

Abstract: Understanding tradeoffs between environmental and nutritional sustainability domains of plant-based beverages versus cow's milk is a pertinent question, with increasing adoption of plant-based diets. Accordingly, we quantify nutrient densities (using a novel nutrient profiling system), protein quality, fatty acid profiles, and environmental impacts (e.g., deforestation, global warming potential, water use, etc.) of these drinks. We assessed cashew, soy, almond, hemp, oat, spelt, rice, and coconut drinks and compared these to cow's milk. We combined literature and database data to estimate environmental impacts from farm to packaging, and a nutritional group measured the nutrient contents of all drinks. We developed a novel metric, to rank food items, termed the Food Substitute Index (FSI20), which is reflective of national nutrient deficiencies across various dietary patterns (e.g., Swiss omnivore diet). We lastly measured environmental impacts against nutrient contents of these various beverage to determine which had a higher combined sustainability score.

Poster 13: Development of enzymatic approach to improve the functionalities of protein recovered from biowaste

Authors: M. Li, R. Mezzenga

Affiliations: Laboratory of Food and Soft Material, ETH Zurich; Future Food Initiative

Contribution to Sustainable Food Systems: Enzyme technology for protein modification helps the efficient exploitation of proteins from renewable sources and the diversification of plant-based product. This research will contribute to waste reduction and the sustainability of environment, food and nutrition.

Abstract: Mimicking the meat-like fibrous structure using plant-based proteins is considered as one strategy to achieve enhanced organoleptic quality of plant-based meat analogues. Enzyme, as a green tool, can modify protein structure and network at molecular level, which affect the final macroscopic assembly of the product. Current study aims at screening for effective enzymatic approaches to aid the fiber formation and rheological improvement of protein-based materials. Biowaste collected from industry, including barley spent grain, potato fruit juice and corn gluten meal were used as starting materials for protein extraction. The protein extracts were treated by different proteolytic enzymes (Alcalase, Flavourzyme, pepsin, trypsin) or cross-linking enzymes (transglutaminase, laccase & tyrosinase). The changes on protein rheological properties and fibrillization potential were illustrated in correlation with the enzyme actions. This work will lay the ground for incorporating enzymatic approaches to common structuring techniques (e.g. extrusion) of plant-based meat analogues for modulating the product texture.

Poster 14: Volcanic proteins

Authors: F. Abiusi, A. Mathys

Affiliations: Sustainable Food Processing Laboratory, ETH Zurich

Contribution to Sustainable Food Systems: Microalgae are the most promising novel food source due to their nutritional merits and their sustainable production. We are developing a new microalgae production process to convert industrial food side-streams into highly nutritious microalgal biomass, generating O2 without CO2 emissions.

Abstract: Microalgae are the most promising novel food source due to their nutritional merits, but high production costs have restricted their use. A powerful strategy to decrease microalgae production costs is using mixotrophic cultivation, where light and an organic carbon source are utilized simultaneously, and biomass productivity is greatly increased. We are developing an innovative "carbon balanced" mixotrophic bioprocess to convert industrial food side-streams into high-quality microalgal biomass rich in protein, generating O2 without CO2 emissions. Using food side-streams will not make the process more sustainable, recovering nutrients that will be otherwise lost, but it will decrease biomass production costs. This will be done using the polyextremophile microalgae *Galdieria sulphuraria*, insolated from volcanic areas. Its natural harsh growing conditions, such as pH below 2 and temperature up to 56˚C, minimize the risk of microbial contamination. *G. sulphuraria* biomass is rich (65% w/w) in proteins with a complete amino acid profile.

Poster 15: Acceptance of 3D printed food by adults and children: Factors affecting willingness to eat

Authors: M. Lanz, C. Hartmann, P. Egan, M. Siegrist

Affiliations: Consumer Behavior Group, ETH Zurich; Texas Tech University, United States of America

Contribution to Sustainable Food Systems: 3D printed food could provide solutions to global challenges such as world hunger, improving food sustainability and reducing food waste – e.g. by printing food for people with diseases or ethical meat made of insects or other

substitutes looking more appealing.

Abstract: 3D food printing is a new technology which allows adjustment to many different demands of both child and adult consumers. However, consumer acceptance of this new food technology appears relatively low. In the present study, an online survey was conducted with 519 adults and their children to investigate attitudes towards 3D printed food and the factors that influence them. First, the adult participants rated images of 3D printed foods on different acceptance measures, followed by their children. A range of ingredients and printed shapes were tested as potential promoters. Second, food neophobia and food disgust sensitivity were examined. The results showed that ingredients, but not shapes, drive acceptance, with meat being the least accepted ingredient. Adults with more education, higher income and lower tendencies towards food avoidance assessed 3D printed food more positively. In summary, consumers are skeptical towards this new technology, but there are numerous possible future applications.

Poster 16: Disgust & colour: Investigating the influence of green food colouring on perceived disgust

Authors: A. Berthold, J. Ammann

Affiliations: Consumer Behavior Group, ETH Zurich

Contribution to Sustainable Food Systems: Gaining knowledge about the antecedents of disgust is important in order to reduce food waste.

Abstract: We tested if individuals' disgust perception differs for food items when they are presented in their natural appearance as compared to green or red colouring. In total, 234 participants rated four food items (milk, chocolate, toast, and tomatoes) in terms of disgust and attractiveness. In the green condition (n = 120) they were presented with two food items in their natural colouring and two food items coloured in green. In the red condition (n = 114) there were two food items in their natural colouring and two food items coloured in red. After the food judgment, we assessed participants' individual disgust sensitivity.

The results show that green shaded food items were rated as more disgusting than the red items or those shown in their natural colouring. Moreover, the data also revealed that the participants individual disgust sensitivity was particularly predictive of disgust judgments when the food items were tinted green.

Poster 17: Neural correlates of taste perception

Authors: J. A. Heng, J. Burkard, L. Kohler, C. Sax, R. Polania, E. J. Windhab

Affiliations: Decision Neuroscience Lab, ETH Zurich; Laboratory of Food Process Engineering, ETH Zurich

Contribution to Sustainable Food Systems: The goal of this project is to better understand the brain-taste axis during food perception. This understanding could be decoded to optimize hedonic value and to create tailored food which could lead to more sustainable eating behavior.

Abstract: What happens in your brain when you take a sip of your favorite drink? We asked 25 participants to rate the sweetness of different samples during Electroencephalography (EEG) and eye tracking measurements. We observed neural signals at specific cortex regions and frequency bands that correlate with the reported sweetness perception. Based on this setup, we can investigate fundamental questions, such as the relationship between gustatory perception and neural cognition. Further, this setup can be used to study how different properties of the food affect perception and its associated brain activity, which could be used to optimize the hedonic value of food and create customized food.

Poster 18: "What I eat to lose weight": A food buffet experiment

Authors: L. Giacone, M. Siegrist, C. Hartmann

Affiliations: Consumer Behavior Group, ETH Zurich

Contribution to Sustainable Food Systems: This study contributes to a comprehensive understanding of how well individuals can put together an adequate menu. This is crucial for developing effective interventions aimed at changing unhealthy eating habits and promoting successful long-term weight control in our obesogenic environment.

Abstract: In an obesogenic environment and due to the prevalent sedentary lifestyle, preventing overnutrition is a challenge. However, people often choose inappropriate weight loss strategies, such as very strong calory limitation, meal skipping, or the ban of certain food products. Therefore, we assessed whether people can successfully construct a menu for the entire day that is healthy and suitable for weight loss. People were instructed to compose a menu from our "fake food buffet" for a usual day and one for a day in which they would want to lose weight, and to answer a nutrition knowledge questionnaire. Results show that most of the participants would lose weight based on their weight loss menu. Therefore, it seems that the vast majority has the theoretical and practical background of how to lose weight. The biggest hurdle is probably the self-discipline to stick to the menu plan over a longer period of time.

Poster 19: Obesity prevention effects of plant varieties through nutrition mediated brown adipose tissue activation

Authors: C. Wu, C. Wolfrum

Affiliations: Laboratory of Translational Nutrition Biology, ETH Zurich

Contribution to Sustainable Food Systems: The identified and isolated bioactive plant extracts/ compounds could be used to produce a whole new line of healthy food products, or they can even be integrated into existing food thus increasing the products' commercial and nutritional values.

Abstract: Obesity is a major health problem, which affects millions of people all over the world. Brown adipose tissue has various desirable functions which are beneficial to mitigate symptoms and progression of obesity. While natural plant extracts are known to have ameliorating effects on obesity, the exact bioactive compounds responsible for its effect in relation with brown adipose tissue activity has yet to be identified or extracted. In this study, we initially screened for plant extracts from various species and genera that shows regulation on brown adipose tissue formation/function. Several potential natural plant extracts were shown to regulate cellular respiration, mitochondrial membrane potential, as well as lipid droplets size in cultured brown adipocytes. The metabolite profiles and the biological effects of these potential candidates will be investigated. Consumption of potential natural plant extracts and/or compounds enriched food products might provide a safe and natural method of preventive nutrition against obesity.

Poster 20: An innovative approach for the rapid metabolite fingerprinting of cocoa beans fermented with antifungal cultures by REIMS

Authors: J. Lestang, S. Streule, S. Boulos, S. Freimüller Leischtfeld, S. Miescher Schwenninger, L. Nyström

Affiliations: Laboratory of Food Biochemistry, ETH Zurich; Food Biotechnology Research Group, ZHAW Zurich, University of Applied Sciences, Wädenswil

Contribution to Sustainable Food Systems: This research contributes to improve food bio conservation which will benefit farmers and retailers by reducing food waste from microbial spoilage. Safer products will be provided to consumers reducing the risks of mycotoxin contaminations and avoiding chemical perseverant use.

Abstract: Fermentation is the first transformation step of cocoa beans into chocolate. Current research develops functional fermentation cultures to prevent fungal contamination, a major issue in cocoa conservation. We aim to characterize the metabolite fingerprints of cocoa beans fermented with and without antifungal cultures using Rapid Evaporative Ionization Mass Spectrometry (REIMS), a novel untargeted analytical method. Statistical models were built based on the metabolite fingerprints to visualize the differences and similarities between the chemical profiles. The models built after confirming the antifungal activity of the cultures permit the discrimination of the beans fermented with and without antifungal cultures with correctness higher than 90%. Chemical markers with high discrimination power were identified. These results indicate that the REIMS analysis combined with chemometric is a promising method for rapid, real-time, and no sample preparation characterization of cocoa quality.

Poster 21: Biochar as a soil amendment to improve soil fertility and crop productivity in yam systems

Authors: H. Ström, V. K. Hgaza, J. Six, E. Frossard

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Contribution to Sustainable Food Systems: This project aims at improving soil fertility in yam cultivation. Soil degradation is a main constraint to increase the productivity and sustainability of yam systems. Yam is an important crop for the livelihoods of millions of people in West Africa

Abstract: Yam (*Dioscorea sp.*) is an important tuber crop for the livelihoods of many people in West Africa. Traditional yam cropping systems usually have a low productivity and can have a negative impact on the environment. The application of biochar is a potential strategy to prevent the degradation of soil fertility in highly weathered tropical soils. The aim of this study is to assess the use of biochar produced from agricultural wastes as a soil amendment in yam production. Field experiments were installed at two sites of different soil fertility levels in Côte d'Ivoire to assess the effect of biochar on tuber yield and soil properties. After two cropping seasons, soil carbon content was increased by biochar inputs but no significant biochar-induced effect on tuber yield was observed. These results indicate that although biochar inputs can alter certain soil properties this may not be reflected in an immediate yield response.

Poster 22: PHENOLIVA: Treatment and valorisation of olive mill wastes

Authors: Y. L. Wong, C. Reinhard, L. Nyström

Affiliations: Laboratory of Food Biochemistry, ETH Zurich

Contribution to Sustainable Food Systems: The PHENOLIVA project implements an integrated waste management concept for the olive oil industry. A novel process is used to extract antioxidants from olive pomace, which is processed into an innovative food antioxidant. Circularity is achieved with all by-products recycled.

Abstract: During olive oil production 80% of the olive ends up as a by-product called olive pomace, a viscous residue that is harmful to the environment if left untreated, due to its high content of organic substances. In Spain, approximately 4 million tons of olive pomace is produced each year. Traditionally, olive pomace has been mainly used as fuel, resulting in a huge loss of nutrients. The PHENOLIVA project aims at circularity in the olive oil industry by implementing an integrated waste management concept. A novel process is used to extract olive antioxidants from olive pomace, which is processed into an innovative food antioxidant. Current research focuses on the characterisation of colour compounds in the olive antioxidant extract and their stability, in order to effectively apply the extract to food products.

Poster 23: Determining the impact of OM-rich fertilizers on plant-available Zn, and Cd, in a wheat growth pot experiment

Authors: J. Bachelder, J. Tolu, L. Winkel, E. Frossard, M. Wiggenhauser

Affiliations: Plant Nutrition Group, ETH Zurich; Group of Inorganic Environmental Geochemistry, ETH Zurich; Eawag, Swiss Federal Institute of Aquatic Science and Technology, Dubendorf

Contribution to Sustainable Food Systems: We investigated how waste-derived fertilizers can be used for Zn biofortification of wheat. Recycled waste application can be a more sustainable practice than applying mineral fertilizers. Zn biofortification contributes to SDG2, "zero hunger", as it combats Zn deficiency in humans.

Abstract: Wheat grown in Zn-limiting conditions can lead to decreased nutritional value of resulting food products. Organic fertilizer application may increase Zn concentrations in wheat, but may also increase uptake of the toxic element Cd. We performed a pot experiment to understand how organic fertilizers impact plant-available Zn and Cd in the soil. Wheat plants were grown in a low-Zn soil that we treated with compost, cattle manure, poultry manure, and sunflower. Plants were harvested eight weeks after sowing and Zn/Cd were extracted from the soil using 0.43M HNO3 (i.e., reactive Zn/Cd). First results showed poultry manure, cattle manure, and compost increased reactive Zn by 10-30% due to Zn derived from the fertilizers. Compost increased reactive Cd by 15%, which included both Cd from the fertilizer and soil, while poultry manure led to a 10% increase in reactive Cd, all derived from soil. Sunflower decreased both Zn/Cd by 12 and 6%.

Poster 24: Wheat (*Triticum aestivum L.*) production in Switzerland under climatic constraints and nitrogen-fertilizer-inputs restrictions

Authors: P. Bongiovani, J. Herrera, L. Levy-Häner, D. Pellet, N. Vuille, E. Frossard

Affiliations: Plant Nutrition Group, ETH Zurich; Groupe de recherche Variétés et techniques culturales, Agroscope, Nyon

Contribution to Sustainable Food Systems: Better understanding of winter wheat production in Switzerland under a changing climate and nitrogen fertilizer restrictions.

Abstract: Wheat demands high levels of nitrogen for high productivity and baking quality. Excessive nitrogen fertilization can cause nitrogen losses, and boost vegetative growth and water consumption, not necessarily increasing grain yield. The fate and plant uptake of nitrogen is influenced by water availability, expected to decrease in certain European regions. Drought affects wheat yield, thus the need of genotypes with stable yield potential and adapted management practices to ensure production. This study aimed to analyze the effect of management practices on wheat grain yields under water and nitrogen limited conditions. Four winter wheat genotypes were sown after three pre-crops in Nyon, Switzerland, under no nitrogen application and up to 180 kg nitrogen ha-1. Rainout shelters intercepted around 40% of the rain during grain filling, in half of the plots. Analysis showed that genotype was the factor with the highest impact on grain yields, while the water limitation had no effect.

Poster 25: Polyploidy: Unlocking a tool to generate novel crop varieties

Authors: A. Gonzalo, P. Parra-Rodriguez, E. Sanchez-Moran, K. Bomblies

Affiliations: Plant Evolutionary Genetics Group, ETH Zurich; University of Birmingham, School of Biosciences Birmingham, United Kingdom

Contribution to Sustainable Food Systems: Many crops species are polyploid as they carry multiple sets of chromosomes. Though polyploidy is associated with greater adaptation and larger organs, artificially generated new polyploids usually poor fertility. We unlocked a tool to partially solve this problem.

Abstract: Many crops have enhanced adaptability and organ size (fruits, leaves, etc.) due to polyploidy. Polyploids are organisms that carry more than two chromosome sets. Although it is very easy to induce polyploidization, these new polyploids often display reduced fertility, which limits this potential tool to generate novel crops. To address this problem, we used the plant model Arabidopsis thaliana where we manipulated meiosis, a specialized cell division that precedes the formation of pollen and egg cells for reproduction. In a normal (diploid) meiosis, since there are only two sets of chromosomes, they form pairs. However, in polyploids, chromosomes can form groups of three, four or more, which disrupts meiosis and fertility. By mutating two genes responsible for the number of interactions between chromosomes during meiosis, we achieved a significant improvement of the formation of pairs. Our research suggests that manipulation of meiosis can be used to improve fertility of new polyploids.

Poster 26: Comparing the cost-efficiency of farm- vs. regional-scale climate change mitigation policies in agriculture

Authors: M. Tarruella, R. Huber, G. Mack, N. El Benni, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH Zurich; Economic Modelling and Policy Analysis, Agroscope, Tänikon

Contribution to Sustainable Food Systems: Achieving sustainable food systems goes hand in hand with the adoption of climate change mitigation policies. However, agricultural policies targeting climate change mitigation often do not consider the sector's heterogeneity, and thus, fail to provide the most cost-efficient regulation. Increasing the cost-efficiency of regulations is key to increasing the adoption of mitigation strategies and ensuring the sustainability of food systems.

Abstract: Climate change mitigation in agriculture is necessary to meet international emission reduction targets such as the ones set by the Paris Agreement. However, current policies are ineffective and expensive. Policy instruments often fail to capture the sector's heterogeneity, limiting the cost-efficiency of emission reduction targets. We here test if using regional instead of farm-level targets for climate change mitigation policies can increase the cost-efficiency of policies. More specifically, we compare and quantify the cost-efficiency of imposing GHG emissions goals at the individual farm level, by introducing a uniform target reduction across farmers, and at a regional scale, leaving flexibility at which farms actual mitigation takes place to what extent. This second approach accounts for the heterogeneity in mitigation costs among farmers. We base our study on a sample of 66 Swiss dairy farms and we consider four mitigation measures (and their interactions) that can be applied by farmers to reach the emission reduction

target without compromising food production. Employing the bioeconomic model FarmDyn and an optimization algorithm, we calculate the opportunity costs and emissions reductions under different GHG reduction targets for the considered farms for both emission reduction target scenarios. We find that targets at a regional scale are more cost-effective, specifically by 88% for a 10% reduction in emissions. Therefore, our results provide a new approach to designing more cost-effective policies.

Poster 27: The effects of heat stress and diet on time budgets of lactating cows

Authors: K. Wang, D. E. Rico, V. Ouellet, A. Boucher, A. Ruiz-Gonzalez, M. Niu

Affiliations: Animal Nutrition Group, ETH Zurich; Centre de recherche en Sciences Animales de Deschambault, QC, Canada; Department of Animal Science, Université Laval, Quebec, QC, Canada

Contribution to Sustainable Food Systems: Heat stress impacts sustainable dairy production. Our study shows that increasing dietary concentration of vitamin D3 and Ca could improve cows lying time during heat stress. Our findings provide valuable guidance for alleviating heat stress and improving animal welfare with supplementation of dietary nutrients.

Abstract: Hyperthermia induces heat stress (HS), which detrimentally impacts cattle behavior and production, and is an animal comfort and welfare issue. Our objective was to characterize lying behavior of dairy cows and to test whether dietary supplementation of vitamin D3 and Ca (VDCa) can alleviate HS. Twelve multiparous Holstein cows were used in a split-plot design with the level of dietary vitamin E and Se (VESe) as main plot. Within each plot, cows were randomly assigned to thermal and dietary treatments: 1) HS, 2) HS with VDCa, 3) thermoneutral pair-feeding (TNPF) in a replicated 3×3 Latin Square design with 14-d experimental periods. Cows under HS spent less time lying than TNPF cows (516.85 vs. 727.61 min/d; $P<0.05$), whereas VDCa increased daily lying time by 0.7h. Cows' circadian patterns were disrupted by HS, with much less lying during late afternoon and early morning periods. These effects were observed independently of VESe.

Poster 28: Impact of extreme events on ecosystem services of temperate permanent grasslands

Authors: Y. Wang, N. Buchmann

Affiliations: Grassland Science Group, ETH Zurich

Contribution to Sustainable Food Systems: Extreme weather and climate events with increased frequency, intensity, and duration have been affecting the provision of ecosystem services by temperate permanent grasslands, which triggers substantial threats against food security by grassland farming systems.

Abstract: Permanent grasslands provide a broad set of ecosystem services (ES), which include both marketable ES (e.g., yield quantity and quality) and non-marketable ES (e.g., biodiversity, greenhouse gas fluxes, soil carbon sequestration, pollination, weed suppression, nitrate leaching, aesthetics). All ES are strongly affected not only by management, plant diversity, and environmental conditions such as soil characteristics and climate, but also by extreme events (e.g., drought, heatwave) and compound extreme events (e.g., combined drought and heatwave). With a comprehensive database search, systematic literature review, meta-analysis, eddy covariance techniques, and statistical analysis, we will explore how extreme and compound extreme events affect the provision of ecosystem services by temperate permanent grasslands with different management intensities and plant diversities. This research project is embedded in the InsuranceGrass project: Assessment of formal, natural, and social insurances: how to cope best with impacts of extreme events on grasslands for sustainable farming systems.

Poster 29: Urban farming enhances agroecological diversity: Designing resilience in city gardens in Querétaro City, México

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Contribution to Sustainable Food Systems: Given the continued trajectory of urbanization-combined with concerns over food security, struggles to ensure adequate food access and nutrition, the environmental implications of industrial food production and long-distance trade – empirical urban agriculture scholarship for policy is ever more urgent.

Abstract: Urban gardens in metropolitan Querétaro, Mexico demonstrate the application of agroecological principles that link food production in the city to agrobiodiversity and socio-ecological resilience. Based on studies of 28 urban gardens, we survey and analyze farming practices using socioecological resilience methodologies and the Diagnostic Survey of Agroecological Practices. We find that agroecological management of urban gardens results in significantly more species richness than conventionally managed plots. Results also indicate that garden plots of approximately 200 m2 harbor the highest levels of agrobiodiversity. This area for home vegetable production appears optimal for user-friendly management practices in urban settings, and could represent a benchmark and goal for urban planning and policy recommendations. We argue that along with protecting land-use rights, promoting a diverse urban landscape ecology can lead to long-term socioecological and food supply resilience, as urban gardens contribute to the adaptive capacities of city dwellers to achieve a degree of food security and sovereignty, and they promote neighborhood social inclusion. The empirical results and insights from this study in Querétaro can inform land use policies for urban agriculture more broadly.

Poster 30: The impact of the war on the Ukrainian agricultural sector

Authors: M. Nehrey, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH Zurich

Contribution to Sustainable Food Systems: Russia's full-scale invasion of Ukraine has had a significant impact on the Sustainable Development Goals. We investigate and discuss the negative effects of the war on the Ukrainian agricultural sector as well as global agricultural markets and food security.

Abstract: Russia's full-scale invasion of Ukraine has caused significant losses not only to the Ukrainian economy but also affected the whole world in terms of agricultural production, markets, and food security. In our research, we investigate the scope, magnitude and dynamics of the effects and implications of the Russian invasion especially for the Ukrainian agricultural sector. To this end, we systematically collect and synthesize evidence from Ukrainian governmental news releases and official statistics. We find that the main challenges for the Ukrainian agricultural sector are working under occupation, logistical problems, a lack of resources for agricultural production, low prices on the domestic agricultural market and a labor shortage. We discuss the possibilities for reconstruction and further development of Ukraine's agricultural sector. Finally, we also discuss consequences for the global economy as a whole: and also possible international policy responses.

Poster 31: Hired labor in food systems: Evidence from Myanmar

Authors: A. Laitha, B. Minten, E. Meemken

Affiliations: Food Systems Economics and Policy Group, ETH Zurich; International Food Policy Research Institute (IFPRI), Washington

Contribution to Sustainable Food Systems: This project will provide new evidence on how conflict affects farm workers' welfare, migration patterns, mental health and labor productivity and is thus relevant for advancing the United Nation's Sustainable Development Goals (SDGs) in food systems, especially food security (SDG 2), health and well-being (SDG 3), and decent work (SDG 8).

Abstract: Wage workers in the agricultural sector are essential for global and local food production. They are often landless and seasonally migrant laborers with limited alternative economic opportunities for improving their livelihoods. These workers are particularly vulnerable in armed conflict settings. They might lose their jobs due to violent conflict and related disruptions in the agricultural sector, also affecting their options to move to other locations (to find work or safety). Additionally, workers exposed to traumatizing events might have mental disorders, which can affect their labor productivity in combination with exploitative working conditions. This project will provide new evidence on the effect of armed conflict on agricultural labor, a topic that has received little to no scientific attention. Using data from the Armed Conflict Location & Event Data Project (ACLED), the International Food Policy Research Institute (IFPRI), and primary survey data, the project will assess the effect of conflict intensity and exposure to violence on labor demand and wages, mobility, mental health, and productivity.

Poster 33: Environmental and social footprints of differently organized coffee value chains in Brazil and the Democratic Republic of Congo (DRC)

Authors: B. Thom, R. Bugale Malembaka, M. Sigrist, J. Jacobi

Affiliations: Agroecological Transitions Group, ETH Zurich

Contribution to Sustainable Food Systems: Global food value chains are the cause of many social-ecological challenges that exacerbate inequalities worldwide. This project aims to better understand what impacts occur where and whether more self-organization in the value chain could help improve the social-ecological conditions.

Abstract: Coffee production provides income for millions of families, but it also leads to many social-ecological challenges that exacerbate inequalities along the value chain. Life Cycle Assessment (LCA) studies have shown that most of the environmental impacts of coffee occur at the (pre-)production stage. However, different environmental LCAs produce different results depending on the selected system boundaries, indicators, and impact categories, and social LCAs are mostly absent. There is a need to involve different stakeholders and connect environmental and social footprints in LCA studies to capture multi-dimensional impacts. This project takes a participatory, (youth-) inclusive, and feminist approach to defining system boundaries, indicators, and impact categories. Using this method, we aim to understand whether higher degrees of self-organization and participation within a value chain can help reduce environmental and social footprints. To assess these relationships, we will collect quantitative and qualitative data for different case studies in Brazil and the DRC.

Poster 34: Wage labor in agri-food systems – insights from the evolving tomato value-chain in Nigeria

Authors: O. Aremu, A. Olajide, E. Meemken

Affiliations: Food Systems Economics and Policy Group, ETH Zurich; University of Ibadan, Nigeria

Contribution to Sustainable Food Systems: The agri-food sector employs a large share of the world's poor. Hence, this project on labor issues in the agri-food sector contributes to promoting more socially resilient food systems and several of the United Nation's Sustainable Development Goals (SDGs).

Abstract: Ensuring progress toward the United Nations' Sustainable Development Goals (SDGs) on healthy diets and wellbeing (#2 & 3), poverty reduction, decent work, and gender equality (#1, 8 & 5) is vital for promoting inclusive economic development. Yet achieving these goals remains a great challenge, particularly amongst agricultural wage-workers who form the core of the rural poor. This project contributes new insights on agri-food labor by focusing on three understudied and interlinked topics: 1.) Does employers' use of contract labor affect recruitment costs and time? 2.) Does technology adoption affect the quantity and quality of employment? 3.) Gender health gaps amongst agri-food workers. Our study is important in light of increasing concerns about promoting socially and economically resilient food systems. The empirical work will focus on employers and wage-workers on farms and processing plants in Nigeria's tomato value chain, given its rapid growth, labor-intensive nature, and importance for nutritional security.

Poster 35: A participatory journey to select nutritious value chains for implementing agroecological interventions in the nutrition in city ecosystems project in Kenya

Authors: E. Imbo, D. Barjolle, S. van den Berg, J. Monroy, M. Pannatier, H. Prytherch, C. Speich, K. Gabrielle van Zutphen, C. Nwokoro, A. Wybieralska

Affiliations: Sustainable Agroecosystems Group. ETH Zurich; Sustainable Agri-Food Consulting; Syngenta Foundation for Sustainable Agriculture, Basel; Sight and Life; Swiss Tropical and Public Health Institute (Swiss TPH), Basel

Contribution to Sustainable Food Systems: Building into the body of knowledge in creating and strengthening resilient food systems, our presentation cuts across 4 SDGs: ending hunger and achieving food and nutrition security – SDG 2, women empowerment – SDG 5, making cities more resilient – SDG 11, responsible consumption, and production – SDG 12, and strengthening partnerships – SDG 17.

Abstract: The Nutrition in City Ecosystems (NICE) project aims to enhance the availability and accessibility of nutritious, agroecologically produced foods in six secondary cities in Bangladesh, Kenya, and Rwanda. The objective of this value chains (VC) analysis was to identify, in a participatory manner, the key nutritious VC for the NICE project interventions in Kenya (Bungoma and Busia). A qualitative, iterative, multi-level, and multi-stakeholder approach was followed for this VC analysis following guidance from the International Fund for Agricultural Development (IFAD) on evidence- and field-based project design.

Five VC – African Leafy Vegetables (spider plant and black nightshade) orange-fleshed sweet potatoes, groundnuts, fish (Tilapia), and indigenous poultry – have been selected to be further supported by the NICE project and several stakeholders (farmers, input suppliers, processors, and consumers). Based on agroecological principles, NICE project will drive the VC upgrade (increased production, beneficial post-harvest activities etc.) in a collaborative and participatory manner.

Poster 36: Coldtivate: A mobile app for increasing smallholder's access to cooling in developing countries

Authors: J. Gajardo, R. Evangelista, K. Shoji, J. Schemminger, C. Verreydt, M Knott, D. Onwude, T. Motmans, T. Defraeye

Affiliations: Simulating Biological Systems Group Group (Simbiosys), EMPA; Basel Agency for Sustainable Energy (BASE), Basel

Contribution to Sustainable Food Systems: Our research seeks to facilitate the access to cooling in the food supply chain of developing countries and decreasing food loss. Our work supports SGD2, in order to increase food security, and the income of small-scale food producers.

Abstract: Coldtivate is an open-access, data science-based mobile application that seeks to increase the accessibility to sustainable food cooling while increasing the income of smallholder farmers and reducing food loss in developing countries. The app digitalizes the operation of cold rooms, assisting operators in managing the different crates of commodities brought by farmers. It features digital twin models that estimate the remaining shelf life of different commodities based on temperature sensor data and the number of days since harvest. It also offers country-specific features such as 14-day daily market price forecasts in India based on a Machine Learning model. Together, these features help to prevent distress selling, and allow farmers for better decision-making in terms of when and where to sell their produce to secure better market prices. Finally, the app also contains a Knowledge Hub to help operators understand best practices when cooling multiple commodities in a cold room.

Poster 37: From wasteland to oasis: Transformative effects of trees on farmland and livelihoods

Authors: I. M. Nienkerke, Y. Sawant, A. Holla

Affiliations: Climate Policy Lab, ETH Zurich; BAIF, India; Kansas State University, United States of America

Contribution to Sustainable Food Systems: We analyze the impacts of an integrated farming system, which includes horticulture but follows an holistic approach and successfully tackles several development goals: 1 - no poverty, 2 - zero hunger, 3 - good health and well-being, 12 - responsible production, 15 - life on land.

Abstract: In spite of an alarming trend of resource degradation and reversal of poverty reduction, there is limited evidence to inform the design of policies. We scrutinize an integrated farming system that includes water resource development, soil conservation, fruit trees and intercropping, to tackle the natural resource degradation and human vulnerability nexus. Can it transform so-called wastelands and lift marginalized smallholders out of poverty? We survey 1,860 households, randomly sampled from 188,231 participants in 4 Indian states. Our results show that degraded farmland can be transformed into green assets if poverty alleviation and environmental regeneration are tackled in a holistic manner. We find a clear and significant trend in improvement of socio-economic factors, including higher income and positive life changes, as well as ecological benefits. By assessing its potential to help farmers escape from chronic poverty and to build resilience, this study provides evidence in the science-policy dialogue of development programs.

World Food System Center Posters

10+ Years of Collaboration at the World Food System Center

Since its founding in 2011 and subsequent public inauguration in 2012, the World Food System Center has brought together researchers from across ETH Zurich with external partners in collaborative ways to tackle the challenges our food system faces.Our mission is to be a leader in scientific research, education and outreach across the food system that contributes to the key challenges of food and nutrition security, environmental health, and social well-being.

We now celebrate these 10+ Years of Collaboration by highlighting activities from 2011-2022.

Author/Illustrator: Jeanne Tomaszewski

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The World Food System Center aims to generate new scientific knowledge with societal, political, and industrial relevance in a manner that supports real-world impact. Our Research Programs span across a wide range of topics and enable new cross-disciplinary and solution-oriented research to address food system challenges.

Author: Ivonne Blossfeld

Creating sustainable change in food systems: 10 years of World Food System Summer School

The innovative educational approach of the World Food System Summer School teaches participants to navigate complexity, transdisciplinarity and build sustainable food systems. So far, we organized 10 courses in 4 different countries, training 235 participants from 54 different countries. The course design, using active teaching methods, builds the capacity of food system leaders to actively contribute to sustainable food systems.

Authors: Toya Bezzola, Monika Piessens, Michelle Grant

World Food System Network – Growing community of world food system leaders

The World Food System Network (WFSN) is a unique international community of food systems expert leaders. Organised by alumni for alumni of the World Food Systems Centre, we have been operating and growing as such since 2019. We share a passion for sustainable food systems practices & a belief that greater things are possible with collaboration.

Come and see more about us in our poster and join our community! Get in touch at wfscalumni@gmail.com and sign up for our newsletter https://wfscalumni.com/

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Authors: Katarina Rodriguez and Roelinda Jongstra

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Food Day @ETH is an annual public event that brings together a diverse audience from academia, industry, government and international organizations for interactive discussions and workshops on food systems innovation and research.

At this year`s edition, we take the opportunity to look back on more than 10 years of food system research, education, and dialogue facilitated by the World Food System Center. At the same time, we will discuss challenges and opportunities that are still ahead of us to transform global food systems to become economically, socially and environmentally sustainable.

Layout & Content: Selina Hess, Ivonne Blossfeld