



Food Day @ETH 2021

Proceedings

05 November 2021
17:30-19:00 CET, ETH Zurich

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, since the SDGs came into effect in January 2016, the world has actually witnessed an increase in the number of persons suffering from hunger.

The Center

The work of the Center is based on the understanding that solutions to food system challenges require collaboration from stakeholders across the entire food value chain. The programs of the Center bring opportunities to students, scientists, and professors who are concerned with food systems in their research and studies. Encouragement of inclusive and creative approaches is key, as is providing interactive platforms to engage with a wide range of local to global stakeholders from different sectors and disciplines.

In 2016, the Center established an annual research symposium to highlight food system research at ETH Zurich and feature presentations from concluding research projects supported by its Research Programs. With Food Day @ETH 2021, this event has seen a total of 28 presentations, 255 scientific posters, and over 1230 participants. The diverse audience provides a unique opportunity for young researchers to share their findings to a multitude of stakeholders, including the general public and university students. Feedback is continually positive for this distinct event that brings food system research from around the globe together.

Join us online:



@ethzWFSC



World Food System Center, ETH Zurich

Program

17:00 Doors Open

17:30 Welcome and Introduction

Presented by

**Robert Finger &
Martijn Sonneveld**

17:35 Session 1: Adapting to Water Scarcity Across Europe

Irrigation modernization and implications for sustainable water resources management in Mediterranean agriculture

Sandra Pool
Water Resources and Drinking Water, Eawag

RELOAD – Assessing the impacts of summer drought on soil ecology and cropping systems' properties

Emily Oliveira
Grassland Sciences,
ETH Zurich & Agroscope

17:55 Session 2: Assessing Organic Production Systems

Black soldier fly larvae as an alternative feed ingredient for poultry

Maike Heuel
Animal Nutrition, ETH Zurich
William Thompson
Sustainable Agroecosystems,
ETH Zurich

Enhancing smallholder farmer climate resilience in cocoa and banana global food value chains

18:20 Panel Discussion: What is the role of science in food system transformation?

Panelists: Robert Finger (Professor of Agricultural Economics and Policy, ETH Zurich), Billie Hauser (Student MSc Food Sciences, ETH Zurich), Isabel Sommer (Project Manager Landwirtschaft mit Zukunft/Ernährungsparlament), Carmen Thönnissen (Co-Head, Global Programme Food Security, SDC), Eliana Zamprogna (Chief Technology Officer, M-Industry)

Moderator:
Christina Senn-Jakobsen
Swiss Food & Nutrition Valley

19:05 Concluding Remarks

19:15 Networking Poster Session and Reception

20:15 Voting for Poster Session Closes

20:30 Poster Prizes Announced

21:00 Symposium Ends

Presentations

The Center aims to generate new scientific knowledge with societal, political, and industrial relevance in a manner that supports real-world impact.

The World Food System Center enables novel interdisciplinary research that contributes knowledge and solutions to key food system challenges. The Center's core research activities also strive to provide leadership and foresight on issues connected to food and nutrition security based on innovative solutions for pressing problems of the world food system.

The Center's Research Programs support new cross-disciplinary and solution oriented research to address food system challenges. Presentations are from two current research programs, the Mercator Research Program on Organic Production Systems for Global Food Security and the Coop Research Program on Sustainability in Food Value Chains, provide support for new projects.

The **Mercator Research Program** on Organic Production Systems, funded by the Mercator Foundation Switzerland, supports research, education, and outreach that explores the role and potential of organic production systems (certified or non-certified) to contribute to global food security.

The **Coop Research Program** on Sustainability in Food Value Chains, supported by the Coop Sustainability Fund, enables research that addresses challenges and opportunities for sustainability in food value chains.

The Center strives to work together with others in partnerships to achieve together what no partner could achieve on their own. We formally develop both strategic and collaborative partnerships, and, in addition, we indirectly foster new partnerships at the project level. This partnership approach, which we developed during our first phase of operations, has been critical to the Center's success.

Title: Irrigation modernization and implications for sustainable water resources management in Mediterranean agriculture

Authors: Sandra Pool^{1,2}, Felix Frances³, Alberto Garcia-Prats³, Cristina Puertes³, Manuel Pulido-Velazquez³, Carles Sanchis-Ibor⁴, Mario Schirmer^{1,5}, Hong Yang^{2,6} and Joaquín Jimenez-Martínez^{1,7}

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⁴ Valencian Center for Irrigation Studies, Polytechnic University of Valencia, Camino de Vera s/n, E-46022 Valencia

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⁶ Department of Environmental Science, University of Basel, Bernoullistrasse 32, CH- 4056 Basel

⁷ Department of Civil, Environmental and Geomatic Engineering, ETH Zurich, Stefano-Franscini-Platz 5, CH-8093 Zürich

Abstract: The sustainability of agriculture in the Mediterranean area is challenged by high irrigation water demands and nitrogen fertilizer losses to the environment, causing significant pressure on groundwater resources and groundwater dependent ecosystems. In this project, we investigate how a transformation from flood to drip irrigation improves the sustainability of Mediterranean agriculture. We conduct our study in the paradigmatic region of Valencia (eastern Spain), which is the largest citrus producing region of Europe. To analyse the impact of the Valencian irrigation transformation on the regional groundwater resources, we combine information on real-case irrigation-fertilizer practices obtained from stakeholder interviews with computational simulations of water and nitrogen fluxes in the environment. We find that a transformation from flood to drip irrigation significantly reduces the recharge and nitrogen leaching fractions on long term. However, the long-term performance of irrigation-fertilizer practices is prone to substantial seasonal and year-to-year fluctuations related to precipitation variability. Explicitly considering this precipitation variability provides the opportunity to (i) quantify the precipitation-related uncertainty of the performance of irrigation practices, (ii) implement an adaptive inter-annual fertilizer management, and (iii) refine existing best management practices. Our findings therefore provide valuable guidance for designing future sustainable water management strategies for Mediterranean agriculture.

This research is supported by the WFSC Coop Research Program. Further information is available on the [IRRIWAM project webpage](#).



Title: RELOAD – Assessing the impacts of summer drought on soil ecology and cropping systems' properties

Authors: Emily Miranda Oliveira^{1,2}, Qing Sun¹, Yujie Liu¹, Anna Katarina Gilgen¹, Valentin Klaus¹, Raphaël Wittwer^{2,5}, Thomas Keller^{2,3}, Martin Hartmann¹, Nina Buchmann¹ and Marcel Van der Heijden^{2,4,5}

¹ ETH Zurich

² Agroscope Reckenholz

³ Swedish University of Agricultural Sciences

⁴ Utrecht University

⁵ University of Zürich

Abstract: As climate change progresses, droughts are becoming increasingly frequent and severe. Crop production is most directly affected. We tested whether different cropping systems vary in their resistance to drought. To do so, we induced 5-10 weeks long moderated summer drought in a field trial with four cropping systems comparing organic vs. conventional farming with different tillage depths. We investigated soil structure, microbial communities, plant water relations, plant phenology and soil functions. Drought reduced crop productivity and litter decomposition similarly in all cropping systems. Drought sensitivity of the different crops was highly species-specific, depending on plant characteristics and not on cropping systems. Within intensively tilled systems, plant available water and Maize root bacterial diversity under drought were higher in organic rather than conventional plots, with the highest levels of microbial biodiversity observed at organic systems with reduced-tillage. Since the soil microbiome is key for soil functions, the cropping system-dependent effects on microbial-plant interactions could ultimately affect soil functions differently. Thus, we emphasise 1) the need to gather more information on different crop species/varieties in response to drought and 2) the urge to include soil ecology (i.e. structure + biodiversity) as an important component of designing climate-resilient cropping systems.

This research is supported by the WFSC Mercator Research Program. Further information is available on the [RELOAD project webpage](#).

Title: Black soldier fly larvae as an alternative feed ingredient for poultry

Authors: Maike Heuel¹, Michael Kreuzer¹, Christoph Sandrock², Florian Leiber², Alexander Mathys¹, Moritz Gold^{1,3}, Christian Zurbrügg³, Emmanuel Frossard¹, Isabelle D.M. Gangnat¹ and Melissa Terranova¹

¹ ETH Zurich

² Research Institute for Organic Farming (FiBL)

³ Eawag

Abstract: Reducing the dependence on imported soybeans in poultry feed requires the use of alternative protein and energy sources of similar high quality that can be produced locally in large quantities. One alternative could be the larvae of the black soldier fly, as they have many advantages compared to crops. The larvae in this project were grown on different substrates under controlled conditions and then integrated into poultry feeds with the aim of completely replacing soybean-based ingredients. The detailed information on the entire production chain will help determine the value of larvae as a sustainable alternative to soy, contributing to the achievement of Sustainable Development Goals of the UN Agenda 2030, especially climate change mitigation. To this end, performance, protein, and energy utilization, as well as carcass, meat and egg quality and the transfer of potential contaminants from the substrate to the food via the larvae were investigated. Overall, the protein value of the larval meal was found to be equivalent to, and in some cases better than, that of soybeans. Performance and product quality were not negatively affected. Contamination of eggs and meat with heavy metals and aflatoxin via the spiked substrate was limited but must be closely monitored.

This research is supported by the WFSC Mercator Research Program. Further information is available on the [Hen and Fly project webpage](#).

Title: Enhancing smallholder farmer climate resilience in cocoa and banana global food value chains

Authors: William J. Thompson^{1,2}, Wilma J. Blaser-Harta⁶, Jonas Joerin^{1,4}, Varun Varma^{2,3}, Solhanlle Bonilla-Duarte⁵, Daniel P. Bebb², Birgit Kopainsky⁷, Leonhard Späth¹, Bianca Curcio¹, Evans Dawoe⁸, Rachael Garrett^{1,9}, Erik Chavez¹⁰, Kenza Benabderrazik¹, Elena Monastyrnaya¹, Pius Kruetli¹, Johan Six¹

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³ Computational and Analytical Sciences, Rothamsted Research, Harpenden, UK

⁴ Future Resilient Systems, Singapore-ETH Centre, Singapore

⁵ Instituto Tecnológico de Santo Domingo (INTEC), República Dominicana

⁶ School of Biological Sciences, University of Queensland, Australia

⁷ Department of Geography, University of Bergen, Norway

⁸ Kwame Nkrumah University of Science and Technology, Ghana

⁹ Department of Humanities, Social and Political Science, ETH Zurich, Switzerland

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Abstract: The global food system is a complex web of people, organizations and nature that interact to nourish humanity's food and nutrition needs. Our food system both causes and suffers from the present climate emergency. For example, the food system causes greenhouse emissions via agricultural expansion driving deforestation and, at the same time, it suffers from increasingly frequent climate shocks, such as droughts and hurricanes, disrupting farming. Our research focuses on how such droughts and hurricanes affect some of the most vulnerable people in our food system, the small-scale farmers that are producing food in tropical regions. These farmers have high exposure to such shocks but limited resources to cope with them. We explore ways in which their resilience – the ability to deal with a shock – can be enhanced. We focus on two groups of small-scale farmer: banana producers in the Dominican Republic and cocoa producers in Ghana.

This research is supported by the WFSC Mercator Research Program. Further information is available on the [OrRes project webpage](#).

Networking Poster Session



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. The work of these food system researchers deserves an audience, and thus, this year, we again present an Online Poster Session in addition to the Food Day @ETH Networking Poster Session.

At the recent UN Food Systems Summit, five action tracks that drive food system transformation were defined. These posters highlight how research at ETH Zurich contributes to these action tracks.

All posters are displayed on [@ethzWFSC Twitter](#) #ETHFoodDays and the [Center website](#) from 03 November 2021.

*Twelve selected poster finalists were invited to share their posters at Food Day @ETH and three were awarded poster prizes, based on attendee voting.

Action Track 1: Ensure access to safe and nutritious food for all

Title: Valorizing protein-based side-streams with pulsed electric field technology

Authors: R. Axelrod, M. Beyrer, A. Mathys

Affiliations: Sustainable Food Processing, ETH Zurich; Institute of Life Technologies, University of Applied Sciences and Arts Western Switzerland Valais-Wallis

Title: Pulsed electric field (PEF) assisted microalgal fungal co-cultivation and nutrient extraction to foster sustainable agri-food systems*

Authors: J. Baumgartner, I. Haberkorn, A. Mathys

Affiliations: Sustainable Food Processing, ETH Zurich; Institute of Life Technologies, University of Applied Sciences and Arts Western Switzerland Valais-Wallis

Title: Boosting productivity of the edible microalgae with bacteria

Authors: M.Huelsmann, V.Tinner, I. Haberkorn, M. Schäfer, M. Ackermann, A. Mathys, J.A. Vorholt

Affiliations: Microbial Systems Ecology, ETH Zurich; Sustainable Food Processing, ETH Zurich; Molecular Health Sciences, ETH Zurich; UMIK, Eawag Dübendorf

Title: CO₂e quantification of food parks*

Authors: J. Merkel, S. Pfister, J. O'Nien

Affiliations: Ecological Systems Design, ETH Zürich; Bühler AG Uzwil

Action Track 2: Shift to sustainable consumption patterns

Title: Nutritionally-invested environmental impacts of food products and national food supply*

Authors: A. Green, T. Nemecek, S. Smetana, A. Mathys

Affiliations: Sustainable Food Processing Laboratory, ETH Zurich; Life Cycle Assessment, Research Division Competitiveness and System Evaluation, Agroscope; German Institute of Food Technologies (DIL e.V.)

Title: Carbon nanotubes: tiny graphene cylinders

Authors: N. Sharif, A. Boghossian

Affiliations: Laboratory of Nanobiotechnology, EPFL

Title: Which would be the best packaging for strawberries from farm-to-fork?*

Authors: C. Shrivastava, S. Schudel, T. Defraeye

Affiliations: Laboratory for Biomimetic Membranes and Textiles, Empa; ARTORG Center for Biomedical Engineering Research, University of Bern

Title: The adoption of fungi-resistant grapevine varieties and marketing channels in Switzerland*

Authors: L. Zachmann, C. McCallum, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH Zurich

Action Track 3: Boosting nature-positive production

Title: The role of risk perceptions in the adoption of a pesticide-free production scheme*

Authors: V. Garcia Gomez, N. Mohring, Y. Wang, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH-Zürich; French National Centre for Scientific Research, CNRS & La Rochelle Université

Title: Identifying levers and constraints to agroforestry in Switzerland from a farming system perspective

Authors: U. Le Goff, D. Barjolle, J. Six

Affiliations: Sustainable Agroecosystems Group, ETH Zurich

Title: The effect of personalized pesticide risk information on intentions to adopt fungi-resistant grapes

Authors: C. McCallum, L. Zachmann, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH Zurich

Title: Improving black soldier fly larvae bioconversion of agri-food wastes and byproducts by pretreatments

Authors: D. A. Peguero, A. Vargas, M. Gold, C. Zurbrügg, A. Mathys

Affiliations: Sustainable Food Processing, ETH Zurich; Department Sanitation, Water and Solid Waste for Development, Eawag

Title: The legume imposter syndrome*

Authors: A. Singh, P. Iannetta, C. Schöb

Affiliations: Agroecology Group, ETH Zurich

Title: Biological Control: Fighting below ground insect pests with entomopathogenic *Pseudomonas* bacteria, nematodes and fungi*

Authors: A. Spescha, M. Brunner, J. Weibel, F. Scheibler, L. Wyser, A. Moix, F. Gillieron, A. Guyer, R. Campos-Herrera, G. Grabenweger, M. Maurhofer

Affiliations: Institute of Integrative Biology, ETH Zurich; Plant Protection Unit, Agroscope; Institute of Grapevine and Wine Sciences, Logroño, Spain

Action Track 4: Advance equitable livelihoods

Title: Assessing the effectiveness and equity of forest-focused supply chain policies in the palm oil, soy, cattle and cocoa sectors*

Authors: J. Brandao, F. Cammelli, J. Grabs, A. Chandra, T. Adoah, R. Garrett

Affiliations: Environmental Policy Lab, ETH Zurich; Department of Society, Politics and Sustainability, Universitat Ramon Llull

Title: Food applications of kabog millet, a heritage crop from Cebu, the Philippines, and lessons learnt for Swiss heritage crops

Authors: J. Oñate Narciso, L. Nyström

Affiliations: Laboratory of Food Biochemistry, ETH Zürich

Title: Nutrition in City Ecosystems (NICE): strengthening the supply and demand for local, agroecologically-produced, nutritious foods in secondary cities in Bangladesh, Kenya, and Rwanda*

Authors: F. Bayisenge, S. Kimenju, S. Fuad Pasha, K. G. van Zutphen-Küffer, J. Six, T. Barth-Jaeggi

Affiliations: Swiss Tropical and Public Health Institute, Kula Vyema Centre of Food Economics, Kenya; Mitra and Associates; Bangladesh, Sight and Life Foundation; Sustainable Agroecosystem Group, ETH Zürich, Swiss Tropical and Public Health Institute, Basel

Action Track 5: Build resilience to vulnerabilities, shocks and stress

Title: For resilient and sustainable local food systems in Switzerland

Authors: P. Donadieu de Lavit, D. Barjolle, J. Six, R. Charles

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

Title: The impact of a changing climate on apple yields in Europe

Authors: L. Giguère, R. Garrett

Affiliations: Environmental Policy Lab, ETH Zurich

Title: Drought impact on the wheat microbiome and its consequences for soil functioning*

Authors: E. Kost, J. Mayer, J. Six, M. Hartmann

Affiliations: Sustainable Agroecosystems, ETH Zurich; Water Protection and Substance Flows, Agroscope

Title: A structural model to evaluate farm-level responses to weather trends

Authors: S. Wimmer, C. Stetter, J. Schmitt, R. Finger

Affiliations: Agricultural Economics and Policy Group, ETH Zurich; Agricultural Production and Resource Economics, Technical University of Munich; Institute of Farm Economics, Johann Heinrich von Thünen Institute, Braunschweig

Title: Promoting shade trees to render Ivorian cocoa cultivation more sustainable*

Authors: N. Windlin, B. Thom, P. Krütli

Affiliations: Transdisciplinary Lab, ETH Zurich; World Food System Center, ETH Zurich



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