



# World Food System Center 2017 Research Symposium

## Program and Abstracts

Wednesday, 25 October 2017 | 17:15 | ETH Zurich, AudiMax (HG F 30)

This public event showcases food systems research taking place at ETH Zurich. It features presentations from concluding research projects supported by our WFS Grants platform as well as updates from our Flagship projects. A networking poster session focusing on ongoing research and Center activities offers participants the opportunity to interact directly with researchers.



# Program

## 17:15 Welcome and Introduction

### 17:25 Session 1: Sustainable Food Value Chains

*Featuring concluding postdoctoral projects supported by the Coop Research Program*

How to sustainably intensify organic Basmati rice production in Uttarakhand, India

A virtual cold chain method to improve ventilated packaging for fresh fruit

Elements of successful novel dual purpose chicken production systems

Development of a high energy red clover

### 18:20 Session 2: Organic Production Systems

*Featuring concluding doctoral projects supported by the Mercator Research Program*

Management practices for improved soil structure in organic farming: A look into the nitrogen cycle

Integrating conservation goals and meat production on marginal lands

### 18:45 Session 3: Updates on World Food System Center Flagship Projects

Food system innovations based on novel microalgae and insect proteins

Adapting to digitalization in the Swiss agro-food sector

Assessing and building resilience in food systems

## 19:15 Concluding Remarks followed by Networking Poster Session and Reception

## 20:30 Poster Awards: Best Overall Poster Prize and Mercator Poster Prize

*Presented by*

**Dr. Charlotte Decock**  
Sustainable Agroecosystems

**Dr. Wentao Wu**  
Building Physics

**Dr. Isabelle Gangnat**  
Animal Nutrition

**Dr. Mike Ruckle**  
Molecular Plant Breeding

*Presented by*

**Viviana Loaiza**  
Sustainable Agroecosystems

**Tobias Zehnder**  
Forage Production and  
Grassland Systems

**Prof. Dr. Alexander Mathys**  
Sustainable Food Processing

**Dr. Eduardo Pérez**  
World Food System Center

**Prof. Dr. Johan Six**  
Sustainable Agroecosystems

## Posters

- 1-OM **LERNfeld – A dialog between young scientists and school children: Raising awareness for global climate change and biodiversity in food production systems** Keller Sabina, Wyss Eric, Buchmann Nina
- 2-OM **Gardens for Haiti – Building vegetable production systems with two schools and an orphanage** Melanie Binggeli
- 3-OM **Strategies for feeding the world more sustainably with organic agriculture** Adrian Muller, Christian Schader, Nadia El-Hage Scialabba, Judith Brüggemann, Anne Isensee, Karl-Heinz Erb, Pete Smith, Peter Klocke, Florian Leiber, Matthias Stolze, Urs Niggli
- 4-OM **The Introduction of organic agriculture in China, 1980-1990** Maya Wohlgemuth
- 5-OM **Assessing the role of organic systems in enhancing food system resilience** William Thompson
- 6-OM **Farming systems based approach to assess and build their resilience in the context of climate change: insights from the Canton of Vaud (Switzerland)** Claire Durand, Ulysse Le Goff, Barjolle Dominique, Johan Six
- 7-OM **Drought impact on ecosystem functions in different management practices** Yujie Liu, Anna Katarina Gilgen, Valentin Klaus, Nina Buchmann
- 8-OM **Using stable isotopes to assess plant water use in response to drought in organic and conventional systems** Qing Sun, Anna Katarina Gilgen, Nina Buchmann
- 9-OM **Plant-microbial interactions in organic and conventional farming systems: Changes in responses to drought** Emily O. Hagen, Yujie Liu, Qing Sun, Valentin Klaus, Raphaël Wittwer, Klaus Schläppi, Marcel van der Heijden, Nina Buchmann
- 10-OM **Boost algae supply chain applying holistic up- and downstream processes** Chaudhary Abhishek, Leandro Buchmann, Lukas Böcker, Alexander Mathys
- 11-OM **Cash or Perish / Harm or Intensify - Ecological intensification of organic rooibos tea production in South Africa** Hannes A. Gamper, Josep Ramoneda i Massagué, Emmanuel Frossard
- 12-OM **Pushing forward white lupin as a local source for protein and nitrogen in Central Europe** Simon Rosenfeld, Ralf T. Voegelé, Monika Messmer, Maria R. Finckh, Roderick M. Szuszkiewicz, Oberhänsli Thomas, Pierre Hohmann
- 13-OM **Improving disease resistance of pea through selection at the plant-soil interface** Lukas Wille, Pierre Hohmann, Monika M. Messmer, Bruno Studer
- 14-OM **Towards nutritional security through organic management of soil fertility in orange-fleshed sweetpotato systems in Mozambique** Rafaela Conz, Engil Pereira, Maria Isabel Andrade, Johan Six



15-0M **Long-term organic matter application reduces cadmium but not zinc in wheat** Roman Grüter, Benjamin Costerousse, Jochen Mayer, Paul Mäder, Cécile Thonar, Emmanuel Frossard, Rainer Schulin, Susan Tandy

16-0M **Reducing nitrate leaching for a more sustainable crop production** Hanna Frick, Astrid Oberson, Emmanuel Frossard, Hans-Rudolf Wettstein, Else K. Bünemann

17-0M **Nitrified urine fertilizer: A transdisciplinary approach to solutions-oriented community development** Ben Wilde, Johan Six, Astrid Oberson, Eva Lieberherr, Isadora Pereira

18-0M **Shade trees mitigate the severity of cocoa swollen shoot virus disease and help maintaining cocoa productivity** Christian Andres, Henry Dzahini-Obiatey, Wilma Blaser, Andreas Gattinger, Samuel Offei, Johan Six

19-0 **The value of species diversity in grasslands (DIVERSGRASS)** Sergei Schaub, Nina Buchmann, Andreas Lüscher, Robert Finger

20-0 **SUSTAIN: Developing a sustainable value chain of brazil nuts (Bertholletia Excelsa) for Swiss consumers. An interdisciplinary approach** Merel Jansen, Manuel R. Guariguata, Fidel Chiriboga, Julia Quaedvlieg, Carmenza Robledo, Juan Andres Santelices, Ricardo M. Bardales, Mishari García, Eriks A. Quispe, Daniel Navarro, Camila Alvarez, Anna Borgersen, Ennia Bosshard, Rens Brouwer, Alessia Capurso; Francisco Ehrenberg, Sara Hellström, Luis Miguel Ramos, Flor Vargas, Gabriela Wiederkehr Guerra, Chris J. Kettle

21-0 **Consumer exposure assessment in Switzerland to antimicrobial resistance in bacteria isolated from retail food – Systematic review** Jans, C., Sarno, E., Collineau, L., Meile, L., Stärk, K., Stephan, R.

22-0 **Field experiment (RCT) on the causal effects of on-farm storage on food security and poverty, and local market prices** Michael Brander, Thomas Bernauer, Matthias Huss

23-0 **No need for words: Development of the Food Disgust Scale (FDPS), an eight-picture tool** Jeanine Ammann, Christina Hartmann, Michael Siegrist

24-0 **Bacterial spore control by high pressure processing as key for sustainable and high quality food sterilization** Yifan Zhang, Alex Waser and Alexander Mathys

25-0 **Assessing and enhancing the resilience of the tef and cocoa value chains in Ethiopia and Ghana** Jonas Joerin, Pius Kruetli, Kenza Benabderrazik, Evans Dawoe, Kebebew Assefa, Samuel Hauenstein, Johan Six

26-0 **Assessing tomato farmers' resilience to market influences and climate change events - A comparative study between Morocco and Ghana** Kenza Benabderrazik, Johan Six, Jonas Joerin, Birgit Kopainsky

27-0 **Bioenrichment of iru: A fermented vegetable protein** Afolake Olanbiwoninu, Christoph Jans, Anna Greppi, Christophe Lacroix

28-0 **Biofortification of staple cereals – addressing micronutrient deficiencies affecting human health** Yuta Kawakami, Simrat Pal Singh, Ting Ying Wu, Kulaporn Boonyaves, Wilhelm Gruissem, Navreet Bhullar

- 29-0 **DROSOPHRISK- Evaluation of risk management strategies and damages** Ladina Knapp, Esther Bravin, Manuela Meraner, Dominique Mazzi, Robert Finger
- 30-0 **Prerequisites for subsequent CRISPR-Cas9-assisted engineering of a Lactobacillus sakei meat starter strain** Jans, C., Lacroix, C., Meile, L.
- 31-0 **The African dairy fermentation system – novel adapted bacteria for food production?** Dasel Wambua Mulwa Kaindi, Wambui Kogi-Makau, Godfrey Nsereko Lule, Bernd Kreikemeyer, Pierre Renault, Bassirou Bonfoh, Esther Schelling, Jakob Zinsstag, Nize Otaru, Thomas Schmid, Christophe Lacroix, Leo Meile, Jan Hattendorf, Christoph Jans
- 32-0 **Identifying sources and variability of iodine in cow's milk to ensure adequate dietary iodine intakes by the Swiss population** van der Reijden, O.L., Galetti, V., Hulmann, M., Krzystek, A., Haldimann, M., Schlegel, P., Manzocchi, E., Berard, J., Kreuzer, M., Zimmermann, M.B., Herter-Aeberli, I.
- 33-0 **Modeling of solar drying of fruit using a multiscale approach** Kevin Prawiranto, Thijs Defraeye, Dominique Derome, Jan Carmeliet
- 34-0 **Soft matter approach to effective preservation of African Leafy Vegetables (ALVs) by drying: SoLVeD** Leonie van 't Hag, Raffaele Mezzenga
- 35-0 **Characterization of Lactobacillus reuteri isolates to inhibit Campylobacter colonization in chicken** Paul Tetteh Asare, Anna Greppi, Clarissa Schwab, Christophe Lacroix
- 36-0 **Color loss kinetics of the functional microalgae protein phycocyanin under short time micro processing** Lukas Böcker, Jakob Surber, Elena Leeb, Kai Reineke, Alexander Mathys
- 37-0 **Two types of resistance against a major wheat disease – Protection from Septoria tritici blotch is achieved by suppressing host damage and pathogen reproduction separately** Petteri Karisto, Andreas Hund, Kang Yu, Jonas Anderegg, Achim Walter, Fabio Mascher, Bruce A. McDonald, Alexey Mikaberidze
- 38-0 **Non-thermal plasma as a sustainable intervention technology to improve shelf life and safety of sprouted seeds** Waskow, A., Betschard, J., Butscher, D., Oberbossel, G., Loessner, M.J., Rudolf von Rohr, P., Schuppler, M.
- 39-0 **Impact of trees on mycorrhizal abundance and soil fertility in low-input maize cropping systems** Dierks, J., Blaser, W.J., Gamper, H.A., Six J.
- 40-0 **Tracking pesticide fate in conventional banana cultivation in Costa Rica: A disconnect between protecting ecosystems and consumer health** Annelie Mendez, Carla Ng, Konrad Hungerbueler
- 41-0 **A novel, high precision multiple-meal stable isotope method to compare iron absorption from extruded FePP-fortified rice containing different zinc compounds, citric acid/trisodium citrate and EDTA in Ghanaian children** Laura Hackl, Abdul-Razak Abizari, Helen Zhungbey, Christophe Zeder, Cornelia Speich, Colin I. Cercamondi, Michael B. Zimmermann, Diego Moretti

**Delivering Food Security on Limited Land** Anna K. Gilgen, Jonna Cohen, Michelle Grant, Nina Buchmann, and DEVIL Consortium Members

**Edible Research: Hands on Learning for Sustainability in Agroecosystems** Anett Hofmann, Anna K. Gilgen, Martina Carrel, Manuel Stamm, Simon Treier, Luna Urrio, Michelle Grant, Johan Six

**Living Lab for Sustainable Campus Catering** Bastian Flury, Patrick Jiranek

**World Food System Summer School-From the Perspective of our Alumni** WFSC Alumni

**World Food System Center Communications** Jeanne Tomaszewski, Jukka Nyström

# **PRESENTATION ABSTRACTS**

## **BasmaSus**

### **How to sustainably intensify organic Basmati rice production in Uttarakhand, India**

C. Decock<sup>a,b</sup>, M. Chakraborty<sup>a,c</sup>, L. Ditzler<sup>a,d</sup>, T.A. Breland<sup>d</sup>, C. Francis<sup>d,e</sup>, D.K. Singh<sup>f</sup>, A. Srivastava<sup>c</sup>, F. Eyhorn<sup>g</sup>, J.C.J. Groot<sup>h</sup>, P. Tiftonell<sup>h</sup>, J. Six<sup>a</sup>

<sup>a</sup> Sustainable Agroecosystems, ETH Zurich

<sup>b</sup> Natural Resources Management and Environmental Sciences Department, California Polytechnic State University

<sup>c</sup> Intercooperation Social Development India

<sup>d</sup> Department of Plant Sciences, Norwegian University of Life Sciences

<sup>e</sup> Department of Agronomy & Horticulture, University of Nebraska – Lincoln

<sup>f</sup> Department of Agronomy, G.B. Pant University of Agriculture & Technology

<sup>g</sup> Helvetas Swiss Intercooperation

<sup>h</sup> Farming Systems Ecology Group, Wageningen University & Research

## **ABSTRACT**

Adoption of organic agriculture where markets are accessible can provide an avenue for smallholder farmers to improve their livelihoods. Organic management practices, however, need to be optimized to the local conditions and verified at the farm scale. In this project, a controlled field trial and farm surveys were conducted to identify suitable management for organic basmati rice cultivation in Uttarakhand, India. The field trial indicated that the introduction of legumes boosts basmati yield, with a positive legacy effect on the following wheat crop. Farm surveys showed important nutrient gaps potentially causing soil fertility decline, but relatively simple interventions such as green manuring, applying purchased manure, capturing livestock urine, or improving manure storage could mitigate soil mining with an estimated increase in net profit of up to 65%. The field data further suggests that such input increases can be attained without severely increasing environmental pollution associated with nitrogen loss.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.



## **PACKCHAIN**

### **A virtual cold chain method to improve ventilated packaging for fresh fruit**

Wentao Wu, Thijs Defraeye, Claudio Beretta, Paul Cronje, Stefanie Hellweg, Umezuruike Linus Opara  
Empa; Building Physics, ETH Zurich; Ecological Systems Design, ETH Zurich

## **ABSTRACT**

An important share of the food losses in the fresh fruit supply chain originate from postharvest unit operations such as precooling, refrigerated transport and cold storage. This study proposes a virtual cold chain (VCC) method to evaluate the performance of ventilated packaging by tracking the temperature history and by predicting quality loss of each individual fruit on a pallet throughout the entire cold chain. The VCC method combines computational fluid dynamics (CFD) with kinetic fruit quality modelling. Clear differences between different carton designs and cooling protocols are found. The cooling performance of carton designs depends on the unit operation with different airflow rates. In a cold chain with precooling in cold stores, instead of forced-air precoolers, about 20% more quality loss is found. The ambient (warm) loading protocol is found to be promising to maintain sufficient quality. The VCC method has a large potential for integrated assessment of packaging design.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## **INDUCE**

### **Elements of successful novel dual purpose chicken production systems**

I.D.M. Gangnat, S. Mueller, R.E. Messikommer, V.H.M. Visschers, M. Siegrist, M. Kreuzer  
Animal Nutrition, ETH Zurich; Consumer Behavior, ETH Zurich

## **ABSTRACT**

Intensive specialisation in the global poultry sector has resulted in a complete decoupling of egg and meat production. Today, poultry is bred either for egg or for meat production by a few globally operating specialised companies. This specialisation is of increasing public concern as for each hatched laying type hen, a laying type cockerel is also hatched but culled due to its inability to satisfactorily produce meat (2.5 million chicks/year in Switzerland). One opportunity to avoid this practice could be using dual-purpose types, where males are fattened for meat and females are used for egg production. However, production efficiency and product characteristics from dual-purpose types differ from that of specialised types. This project investigated the key elements of successful dual purpose poultry production systems. Our research covered the egg and meat production sides of dual purpose systems, their applicability, their resilience against decreasing diet quality and their valuation by consumers.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## **HERC**

### **Development of a high energy red clover**

Michael E. Ruckle<sup>a</sup>, Michael Meier<sup>a</sup>, Lea Frey<sup>a</sup>, Samuel C. Zeeman<sup>b</sup>, Bruno Studer<sup>a</sup>

<sup>a</sup> Molecular Plant Breeding, ETH Zurich; <sup>b</sup> Plant Biochemistry, ETH Zurich

### **ABSTRACT**

Red clover (*Trifolium pratense* L.) is one of the most important forage legumes in grassland agroecosystems worldwide. Although red clover has a high biomass potential and is particularly valued for its nitrogen-fixing capacity and high protein content, red clover herbage lacks the high-energy carbohydrates required to meet the productivity potential of modern livestock breeds. Like most plants, red clover accumulates diurnal starch in its leaves during the day as a temporary carbon store of photosynthesis. Using a reverse genetics approach based on Targeting Induced Local Lesions in Genomes (TILLING), alleles affecting leaf starch accumulation and mobilization will be identified and exploited, to improve the harvestable leaf starch concentration. Increasing the energy content in red clover will help deliver a higher proportion of animal feed intake from environmentally sustainable and locally produced roughage.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## **NORGS**

### **Management practices for improved soil structure in organic farming: A look into the nitrogen cycle**

Viviana Loaiza Puerta<sup>a</sup>, Engil Pujol Pereira<sup>a</sup>, Raphaël Wittwer<sup>b</sup>, Marcel van der Heijden<sup>b,c,d</sup>, Johan Six<sup>a</sup>

<sup>a</sup> Sustainable Agroecosystems, ETH Zurich

<sup>b</sup> Research Division, Agroecology and Environment, Agroscope

<sup>c</sup> Department of Evolutionary Biology and Environmental Studies, University of Zürich

<sup>d</sup> Institute of Environmental Biology, Utrecht University

## **ABSTRACT**

Conventional tillage is used in organic agriculture particularly to control weeds, since herbicides are not permitted. However, it has negative effects on soil structure leading to nutrient loss and soil erosion. No tillage and reduced tillage are alternatives that minimize soil disturbance and breakdown of soil structure, while the use of cover crops and a ley period may allow for soil structure recovery. We investigated how these practices impact storage, availability and loss of nitrogen, an essential plant nutrient and notorious contaminant. Using a field experiment, we found that organic management combined with reduced tillage improved soil structure after the crop rotation while it maintained N supply and losses similar to conventional practices. It also led to different microhabitats that supported a higher genetic diversity of N cycling microorganisms. The ley period improved soil structure for conventional intensive tillage. Validating improved practices increases the efficiency of organic farming.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## EG4BM

### Integrating conservation goals and meat production on marginal lands

Tobias Zehnder<sup>a,b</sup>, Manuel K. Schneider<sup>a</sup>, Andreas Lüscher<sup>a</sup>, Michael Kreuzer<sup>b</sup>, Joel Berard<sup>b</sup>

<sup>a</sup> Forage Production and Grassland Systems, Agroscope; <sup>b</sup> Animal Nutrition, ETH Zurich

#### ABSTRACT

Biodiversity and livestock production potential is decreasing due to widespread shrub encroachment on marginal alpine pastures. We showed that the decline in plant species richness is most severe where *Alnus viridis* dominates the succession. Although forage in the *A. viridis* understory is abundant and quite rich in protein, the pastoral value of this plant community is generally underestimated because most common grazers have difficulties in accessing it. However, in our experiments Dexter cattle and Engadine Sheep proved to be adequate in exploiting such heavily encroached pastures, additionally damaging the shrubs through browsing. Both breeds performed equally well or even better on pastures with high shrub cover in terms of average daily weight gain, carcass proportion of the body, and tenderness and water holding capacity of the meat. Extensive grazing systems utilising robust breeds can add to national conservation goals in Switzerland and sustain a viable meat production in marginal areas.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.



# POSTER ABSTRACTS

## Poster Prizes

**Best Overall Poster Prize:** 1000 CHF award to be used for any food system related research, education, or outreach activity; and

**The Mercator Poster Prize:** 1000 CHF to be used for any organic food or agriculture related research, education, or outreach activity. To be considered for this award, a poster should touch on the role of organic production systems in addressing food security.

**-O** denotes a poster is eligible for only the Best Overall Poster Prize

**-OM** denotes a poster is eligible for both prizes

The audience is kindly requested to cast their vote for which poster they would like to receive each prize. Ballot slips will be handed out at the door. Please place in the corresponding ballot box by 20:30.

## **Poster 1-0M**

### **LERNfeld – A dialog between young scientists and school children: Raising awareness for global climate change and biodiversity in food production systems**

Keller Sabina, Wyss Eric, Buchmann Nina  
Grasslands Sciences, ETH Zurich; GLOBE

#### **ABSTRACT**

Early-career scientists participating in the outreach project LERNfeld raise awareness of primary and secondary school children for global climate change and biodiversity in food production systems. They provide tutorials on methods, how to collect data, and coach children to understand the science behind the data. In return, early-career scientists benefit from these interactions, gaining educational and outreach experiences. This year, 13 early-career scientists coached over 500 school children experiencing agricultural science.

## **Poster 2-0M**

### **Gardens for Haiti – Building vegetable production systems with two schools and an orphanage**

Melanie Binggeli  
Agricultural Sciences, ETH Zurich

#### **ABSTRACT**

Educating young children in Haiti in how to build a vegetable garden is the first goal of this project: Together with two schools and an orphanage, small mobile low-tech low-cost vegetable garden systems are currently built. The initial garden system - which was developed by an organic farmer in Switzerland - was especially constructed to raise climbing summer vegetables in developing countries. It is now applied and extended by the student in Haiti. Further, education material on organic gardening, composting, environmental pollution, population growth and creative trash recycling are prepared to teach the children both theoretically and practically on how to adapt to their own and their countries challenges.

### **Poster 3-0M**

#### **Strategies for feeding the world more sustainably with organic agriculture**

Adrian Muller, Christian Schader, Nadia El-Hage Scialabba, Judith Brüggemann, Anne Isensee, Karl-Heinz Erb, Pete Smith, Peter Klocke, Florian Leiber, Matthias Stolze, Urs Niggli

Agricultural Economics and Policy, ETH Zurich; FiBL

#### **ABSTRACT**

Organic agriculture is proposed as a promising approach to achieving sustainable food systems, but its feasibility is also contested. We use a food systems model that addresses agronomic characteristics of organic agriculture to analyse the role that organic agriculture could play in sustainable food systems. Here we show, that a 100% conversion to organic agriculture needs more land than conventional agriculture but reduces N-surplus and pesticide use. However, in combination with reductions of food wastage and food-competing feed from arable land, with correspondingly reduced production and consumption of animal products, land use under organic agriculture remains below the reference scenario. Other indicators such as greenhouse gas emissions also improve, but adequate nitrogen supply is challenging. Besides focusing on production, sustainable food systems need to address waste, crop-grass-livestock interdependencies and human consumption. None of the corresponding strategies needs full implementation and their combined partial implementation delivers a more sustainable food future.

### **Poster 4-0M**

#### **The Introduction of organic agriculture in China, 1980-1990**

Maya Wohlgemuth

History of Technology, ETH Zurich

#### **ABSTRACT**

Given China's global importance as food producer and consumer, it is important to understand the factors that led Chinese agronomists to pursue an organic approach. Sources from Chinese journals and newspapers discussing the issue of organic agriculture from 1980-1990 provide the basis for the following findings: First, organic agriculture was supposed to solve environmental problems, many of which were caused by the radical transformation of China's agriculture during the Mao era. Second, organic food production was seen as a way to introduce new scientific standards into production and thus modernize the country's agriculture. Third, organic farming offered the opportunity to maintain traditional know-how Mao's 'industrialist' path to modernization had neglected. These three points show how seriously Chinese agronomists were taking the question of finding more sustainable solutions. Thus Chinese organic development can also be seen as an example of how sustainable agriculture can be established and promoted in post-socialist economies.

## Poster 5-0M

### **Assessing the role of organic systems in enhancing food system resilience**

William Thompson and Johan Six  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

In order to achieve global food security, the food system needs more resilience versus increasing perturbation, driven by global change. Organic systems (value chains) have been proposed as a strategy to increase the resilience of food systems, for example through their lower reliance on external inputs and greater ability to conserve natural capital. Thus, this PhD project assesses and compares the resilience of organic value chains versus their conventional counterparts. We conduct this comparison on two study case value chains: cocoa from Ghana and banana from the Dominican Republic. This adopts a transdisciplinary approach to identify key threats to these systems and later develop measures to enhance resilience against these threats. In the second phase of the project, big data describing shocks, such as drought, will be coupled with food system processes and architectures, characterised through surveys, to evaluate the resilience of these food systems.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>. It is part of the WFSC Flagship Project Enhancing Resilience in Food Systems: <http://www.resilientfoodsystems.ethz.ch>

## Poster 6-0M

### **Farming systems based approach to assess and build their resilience in the context of climate change: insights from the Canton of Vaud (Switzerland)**

Claire Durand, Ulysse Le Goff, Barjolle Dominique, Johan Six  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

In the context of climate change and globalisation, enhancing resilience of farming systems is as an important factor for the sustainability of food systems. The Canton of Vaud (Switzerland) has a great diversity of agroecosystems and farming systems. To assess the resilience of the agriculture at the Canton level, we first aimed to characterise the farming systems and select a representative sample of them for further analyses. Literature review and qualitative interviews with experts allowed to aggregate structural variables of the farming systems. Stratified sampling method enabled to group the 3600 farms in Canton Vaud in clusters of distinctively different farming systems. The results showed a stratification in 20 strata representing the cantonal farming systems and the major value chains. Within each strata, we randomly selected farmers to assess resilience using the SHARP tool designed by FAO. The outputs will be discussed in workshops to identify innovations for building resilience.

This project is part of the WFSC Flagship Project Enhancing Resilience in Food Systems: <http://www.resilientfoodsystems.ethz.ch>

## **Poster 7-0M**

### **Drought impact on ecosystem functions in different management practices**

Yujie Liu, Anna Katarina Gilgen, Valentin Klaus, Nina Buchmann  
Grasslands Sciences, ETH Zurich

#### **ABSTRACT**

Both the frequency and severity of drought periods are projected to increase in the next 50 years, with strong impacts on arable farming and ecosystem functioning. Various management practices have been developed to enhance food production in organic farming, but their impact on the resilience towards drought and further ecosystem functions remains unclear. The FAST trial, including organic and conventional farming regimes and tillage/no tillage experiments will be used to assess the response of different ecosystem functions within arable crops and temporary grasslands to different nitrogen fertilizer levels and drought treatments. Litter decomposition will be assessed by applying the Tea Bag Index method (TBI) and the nitrogen leaching risk will be estimated by resin bags, which capture nitrate in soil below the main rooting zone. Further indicators such as herbivory or plant infection will also be measured to determine ecosystem multifunctionality.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## **Poster 8-0M**

### **Using stable isotopes to assess plant water use in response to drought in organic and conventional systems**

Qing Sun, Anna Katarina Gilgen, Nina Buchmann  
Grassland Sciences, ETH Zurich

#### **ABSTRACT**

It is assumed that plants take up water from deeper soil layers during periods of drought to maintain rates of transpiration and photosynthesis. This assumption has been tested in grassland systems but there have been few studies on arable systems considering different farming practices.

We will determine (1) if crops are more likely to use deeper soil water during droughts; and (2) if organic farming and no/reduced tillage contribute to higher drought resilience when compared to conventional and normal tillage farming.

We will use the FAST (Farming Systems and Tillage Experiment) trial to assess water use and uptake in response to simulated drought using stable oxygen-18 and hydrogen-2 (deuterium) isotopes in soil, plants and precipitation. Drought periods will be simulated with portable roofs. Both a linear interpolation method and a Bayesian mixing model will be utilized to analyze the proportional contribution of water sources for plant uptake.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.



## **Poster 9-0M**

### **Plant-microbial interactions in organic and conventional farming systems: Changes in responses to drought**

Emily O. Hagen, Yujie Liu, Qing Sun, Valentin Klaus, Raphaël Wittwer, Klaus Schläppi, Marcel van der Heijden, Nina Buchmann  
Grasslands Sciences, ETH Zurich

#### **ABSTRACT**

Models project a mean reduction in Swiss summer precipitation by mid of the century of around 15%. It is unclear, however, how different farming systems will cope with irregular and rush climatic conditions and which is most resilient against climate change. Our goal is to compare four main Swiss arable farming systems (i.e. organic arable farming with tillage and reduced tillage and conventional arable farming with and without tillage) and test their response to simulated summer drought. For this, a severe drought will be promoted by rain shelters in maize, pea/oat and winter wheat fields. We will assess the significance of belowground biological diversity for drought resilience and nutrient uptake by the crops. Our results will contribute to i) a better understanding of important processes taking place at different farming systems, and ii) formulating pro-active responses to climate change, allowing for gradual and informed adaptation to better meet agricultural goals.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## **Poster 10-0M**

### **Boost algae supply chain applying holistic up- and downstream processes**

Chaudhary Abhishek, Leandro Buchmann, Lukas Böcker, Alexander Mathys  
Sustainable Food Processing, ETH Zurich

#### **ABSTRACT**

The principle objective of NewAlgae is the interdisciplinary development of innovative up- and downstream algae processing based on electroporation stress induction during cultivation, gentle extraction, advanced characterisation of techno-functional protein properties and further translation into the development of new product applications. Scientific focus of NewAlgae elucidates influence of nanosecond pulsed electrical fields (nsPEF) on protein biomass production as well as potential alterations in the protein composition of the algae. A model strain with GRAS status, *Arthrospira platensis*, is utilised for phototrophic cultivation. This will i) deliver technological insights on boosted cultivation, detailed characterisation of functional and bulk proteins from algae and ii) offer solutions to industry for the exploitation of algae as an alternative source of high added value proteins for human nutrition. Therefore, NewAlgae supports the way towards global food security by technology driven innovations and concrete product applications.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>. It is part of the WFSC Flagship Project Novel Proteins for Food and Feed: <http://www.worldfoodsystem.ethz.ch/research/flagship-projects>

## Poster 11-0M

### **Cash or Perish / Harm or Intensify - Ecological intensification of organic rooibos tea production in South Africa**

Hannes A. Gamper, Josep Ramoneda i Massagué, Emmanuel Frossard  
Plant Nutrition, ETH Zurich

#### **ABSTRACT**

If staple food cannot be grown, it has to be brought in by returns from cash cropping. This is the strategy followed by historically disadvantaged small scale farmers of a remote and mountainous area in South Africa. These farmers cultivate rooibos, an indigenous legume shrub, in extremely nutrient impoverished soil under semi-arid climatic conditions where virtually no other crop would thrive. This project is evaluating the use of mineral nutrients and organic matter, gathered from the surrounding vegetation in night time enclosures of sheep, in combination with microbes from adjacent relict wild populations for joint use in nursery seedling production. Sheep dung addition, indeed, doubled seedling size, whereas microbial community assembly is being analysed. The low-cost ecological intensification procedure suggested by this project shows great promise in setting the production of Rooibos Tea on a sustainable footing in light of increasing threads by desertification as a consequence of soil degradation and climate change.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## Poster 12-0M

### **Pushing forward white lupin as a local source for protein and nitrogen in Central Europe**

Simon Rosenfeld, Ralf T. Voegelé, Monika Messmer, Maria R. Finckh, Roderick M. Szuskiewicz, Oberhänsli Thomas, Pierre Hohmann  
Research Institute of Organic Agriculture (FiBL)

#### **ABSTRACT**

White lupin (*Lupinus albus* L.) is a promising leguminous crop. Europe is fully dependent on protein and nitrogen fertiliser imports. This has tremendous negative effects both in Europe and the producing countries, such as loss of terrestrial biodiversity, pollution of freshwater, increase of greenhouse gases and soil acidification. Diverse crop-rotations with a substantial amount of pulses are a proven solution. The protein composition and yield potential of white lupin suggest that it could become the 'Soy of the North'. Currently, the seed-borne pathogen *Colletotrichum lupini* is substantially impeding the cultivation of white lupin in Central Europe. We developed a DNA-based diagnostic test to identify and quantify the fungal pathogen in plants and seeds. This technique will allow us to improve our understanding of the *Colletotrichum lupini* life cycle and, thereby, lay the basis for an advanced resistance breeding approach.

## Poster 13-0M

### **Improving disease resistance of pea through selection at the plant-soil interface**

Lukas Wille, Pierre Hohmann, Monika M. Messmer, Bruno Studer  
Molecular Plant Breeding, ETH Zurich

#### **ABSTRACT**

Pea (*Pisum sativum* L.) is a valuable protein source for food and feed. Pea is able to significantly improve soil fertility and, hence, represents an ecologically important crop in low-input farming systems. Despite their importance, pea cultivation remains below expectations due to low and unstable yields caused by a complex of soil-borne pathogens. The goal of this project is to improve our understanding of resistance mechanisms of pea against soil-borne diseases. To achieve this goal, more than 300 pea lines were evaluated for resistance in pot-experiments and a subset of susceptible and resistant pea genotypes has been identified. In a next step, key pathogens and beneficials in the pea rhizosphere and the role of root exudates in determining the occurrence of these microbes will be investigated. The study will shed light on the complex interactions between pea genotypes and soil microbes, and promote resistance breeding programmes for legumes.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## Poster 14-0M

### **Towards nutritional security through organic management of soil fertility in orange-fleshed sweetpotato systems in Mozambique**

Rafaela Conz, Engil Pereira, Maria Isabel Andrade, Johan Six  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

Orange-fleshed sweetpotato (OFSP) is a nutritious staple food in Mozambique. Its cultivation, however, lacks proper soil fertility management causing depletion of soil nutrients. Adequate management improves nutrient use efficiency and enhances the soil capacity to sustain long-term cropping, which are particularly important for resource limited rural communities. We investigated the potential of cowpea residues, poultry manure and weed biomass incorporation to improve nutrient use efficiency and accumulation of soil nutrients for OFSP sustainable cropping. Our trials show that potassium (K), phosphorus (P) and organic nitrogen (N) can be replenished through weed biomass incorporation, particularly when combined with poultry manure fertilizer. Furthermore, the use efficiency of N, P and K from organic fertilizers were similar to the plots receiving inorganic fertilizer. Therefore, weed biomass incorporation preserves long-term soil fertility while organic fertilization maintains plant uptake and nutrient use efficiency as conventional fertilization.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## Poster 15-0M

### Long-term organic matter application reduces cadmium but not zinc in wheat

Roman Grüter, Benjamin Costerousse, Jochen Mayer, Paul Mäder, Cécile Thonar, Emmanuel Frossard, Rainer Schulin, Susan Tandy  
Soil Protection, ETH Zurich; Plant Nutrition, ETH Zurich; Institute for Sustainability Sciences, Agroscope; Research Institute of Organic Agriculture (FiBL)

#### ABSTRACT

Wheat is a major source of Zn, an essential micronutrient, and Cd, a toxic heavy metal, to human diets. We used long-term field trials to investigate the impact of long-term organic, mineral or combined fertilizer inputs on total and phytoavailable concentrations of soil Zn and Cd and their accumulation in winter wheat grains (*Triticum aestivum* L.). Long-term organic fertilization led to lower accumulation of Cd in wheat grains, but did not affect grain Zn, leading to higher Zn/Cd ratios, as desired for human nutrition. Mass balances indicated that high Zn and Cd inputs with organic fertilizers and high Cd inputs with phosphate fertilizers were the main reasons of positive balances, while mineral fertilization led to the depletion of soil Zn due to higher yields (higher Zn exports with harvest) than under organic management. The study supports the use of organic fertilizers for improving the nutritional quality of wheat grains with reduced Cd concentrations in the long-term.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## Poster 16-0M

### Reducing nitrate leaching for a more sustainable crop production

Hanna Frick, Astrid Oberson, Emmanuel Frossard, Hans-Rudolf Wettstein, Else K. Bünemann  
Plant Nutrition, ETH Zurich

#### ABSTRACT

Nitrate leaching from agricultural sites poses a serious risk to both human health and natural ecosystems. Nevertheless, crop production depends on nitrogen input, either as mineral or organic fertilizers, whereby the latter are suspected to have an even higher leaching risk. For sustainable farming, it is therefore crucial to find strategies to optimize nitrogen use efficiency.

In a microplot study, animal manure, mineral fertilizer, or composted animal manure, each labelled with the stable nitrogen isotope  $^{15}\text{N}$ , will be applied to two different field sites. Repeated analysis of plant, soil and drainage water samples over 2.5 years, will allow tracking the fate of the nitrogen applied with the fertilizers in the field.

We expect to gain valuable insights into the sources of nitrate in agricultural drainage water as well as the fate of nitrogen from fertilizers in the environment over several years, helping to develop strategies to optimize nitrogen use efficiency for a more sustainable crop production.

## **Poster 17-0M**

### **Nitrified urine fertilizer: A transdisciplinary approach to solutions-oriented community development**

Ben Wilde, Johan Six, Astrid Oberson, Eva Lieberherr, Isadora Pereira  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

Rapidly growing informal settlements in the developing world currently face major development crises, two of which are the inadequate provision of basic sanitation and chronic food insecurity. Although traditionally viewed as distinct matters to be solved with disparate solutions, there is growing awareness that technologies designed to close the nutrient loop offer a means to simultaneously improve both issues. In particular, a system designed and tested at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), shows great promise as an ecologically sustainable, hygienically safe, and socially equitable alternative to traditional sanitation management that can, through the separation and biological processing of N- and P-rich urine, provide sustainably sourced fertilizer to close the agricultural nutrient cycle. This project will seek to continue testing the potential of this nitrification technology. By conducting trans-disciplinary, solutions-oriented research, this work will quantify both the biophysical and social implications of using processed human urine as a fertilizer for agricultural cropping systems.

This research is supported by the WFSC Mercator Research Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/MRP>.

## **Poster 18-0M**

### **Healthier cacao in West Africa**

Christian Andres, Henry Dzahini-Obiatey, Wilma Blaser, Andreas Gattinger, Samuel Offei,  
Johan Six  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

Ghana is the second largest producer of cocoa (*Theobroma cacao*). The Cocoa Swollen Shoot Virus Disease (CSSVD) is one of the major productivity limitations, and the only treatment is cutting down infected trees and replanting with virus-free planting material. The governmental CSSVD program in Ghana has cut out more than 300 million trees, and 80 years of research have only led to partial successes. Thus, CSSVD is still prevalent and farmers' adoption of CSSVD control options remains limited.

This project consolidated the state of knowledge about CSSVD control options (meta-analysis), showed that shaded cocoa production systems (agroforestry) can reduce the severity of CSSVD, and identified the main constraints for adoption of available CSSVD control options. These results should help elaborating an implementation action plan to boost the dissemination of feasible CSSVD control options. Dissemination materials include illustrated leaflets, Bluetooth-ready videos and radio programs about CSSVD management.



## Poster 19-0

### **The value of species diversity in grasslands (DIVERSGRASS)**

Sergei Schaub, Nina Buchmann, Andreas Lüscher, Robert Finger  
Agricultural Economics and Policy, ETH Zurich; Grassland Sciences, ETH Zurich; Forage  
Production and Grassland Systems Agroscope

#### **ABSTRACT**

Grasslands play a central role in global food security. They cover major shares of the world's agricultural area and provide a wide range of ecosystem services. Species diversity (SD) is a crucial determinant in the grassland production as it increases and stabilizes biomass yields. The goal of the DIVERSGRASS project is to transform ecological findings into economic terms and to evaluate diversity from farmers' perspective. This will serve public and private actors as basis for decision-making and facilitate sustainable intensification. Preliminary results show that higher SD benefits farmers, through increased production, considering different management intensities, forage yield and its quality. Moreover, results from intensive grasslands show that risk-averse farmers gain not only from yield increases but also from risk reduction due to SD. In the next steps, the analysis will focus on the value of SD under climatic extremes and on the interdependencies between agricultural policies, insurances and SD.

## Poster 20-0

### **SUSTAIN: Developing a sustainable value chain of brazil nuts (*Bertholletia Excelsa*) for Swiss consumers. An interdisciplinary approach**

Merel Jansen, Manuel R. Guariguata, Fidel Chiriboga, Julia Quaedvlieg, Carmenza Robledo, Juan Andres Santelices, Ricardo M. Bardales, Mishari García, Eriks A. Quispe, Daniel Navarro, Camila Alvarez, Anna Borgersen, Ennia Bosshard, Rens Brouwer, Alessia Capurso; Francisco Ehrenberg, Sara Hellström, Luis Miguel Ramos, Flor Vargas, Gabriela Wiederkehr Guerra, Chris J. Kettle  
Ecosystem Management, ETH Zurich

#### **ABSTRACT**

The Brazil nut is a giant tropical rainforest tree found across the Amazon. Its nutritious nuts are harvested from the wild, and are one of the most economically important non-timber forest products in the world. Resilient supply chains for Brazil nuts provide an opportunity to alleviate poverty and conserve tropical forest. The ultimate aim of this project is to help COOP develop a resilient Brazil nut supply chain from Peru to Switzerland. We use an interdisciplinary approach to: a) obtain a clear understanding of how habitat degradation influences Brazil nut reproduction; b) understand and reduce the barriers harvesters face to adopt certification; c) raise consumer awareness in Switzerland of the nutritional, environmental and social benefits of Brazil nuts. On our poster, we will present the first results of the project, which will be accompanied by a video recently shot in the Peruvian Amazon, in which we answer some important questions about our project.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## **Poster 21-0**

### **Consumer exposure assessment in Switzerland to antimicrobial resistance in bacteria isolated from retail food – Systematic review**

Jans, C., Sarno, E., Collineau, L., Meile, L., Stärk, K., Stephan, R.  
Food Biotechnology, ETH Zurich

#### **ABSTRACT**

Antimicrobial resistance (AMR) in bacteria is an increasing health concern requiring new holistic mitigation strategies. The food chain contributes AMR transmission between animals and humans. This study aimed to assess AMR prevalence in retail food and exposure of Swiss consumers in a systematic literature review. Data from 314 yielded 122'488 food samples and 38'371 bacteria isolates; 30'092 samples and 8'800 isolates were AMR positive. Medium and high AMR exposures scores were calculated for *Campylobacter*, *Salmonella*, *Escherichia coli*, *Staphylococcus* and *Enterococcus* in raw meat products; *Vibrio*, *E. coli* and *Staphylococcus* in seafood; and concerning also in *Enterococcus* and technologically important bacteria (incl. starters) in fermented or processed dairy products for direct consumption. Surveillance of AMR in dairy, plants, fermented meat and novel food products, the role of indicator bacteria, starter culture bacteria and their genetic background in AMR gene transfer needs better integration in systematic food-related One Health AMR surveillance programs.

## **Poster 22-0**

### **Field experiment (RCT) on the causal effects of on-farm storage on food security and poverty, and local market prices**

Michael Brander, Thomas Bernauer, Matthias Huss  
International Relations, ETH Zurich; Project Hosting Institution (SNIS Grant): UZH; IFI

#### **ABSTRACT**

We address key research gaps on post-harvest losses by assessing the causal effects of improved on-farm storage on food security of smallholder farmers and local market prices. We implement a cluster-randomized control trial (RCT) in Tanzania with 66 farmers groups (clusters) and 1023 households. Blocked randomization is used to allocate farmers groups to treatment and control. Treatments are trainings and incentives for adopting improved on-farm storage (e.g. hermetic storage bags), implemented by Helvetas. As a focus lies on the role of harvest seasonality in mediating the effects of on-farm storage, we implement simple SMS-based mobile phone surveys, which allow for frequent data collection, e.g. weekly market prices. Survey respondents receive an airtime top-up upon completion of a survey. We achieved a response rate of 40% on average since data collection start in June 2017. We present the research and insights into using SMS surveys for data collection in developing countries.

## **Poster 23-0**

### **No need for words: Development of the Food Disgust Scale (FDPS), an eight-picture tool**

Jeanine Ammann, Christina Hartmann, Michael Siegrist  
Consumer Behavior, ETH Zurich

#### **ABSTRACT**

The emotion of disgust influences our food choices. To provide a tool for the assessment of food disgust sensitivity to help predict possible reactions, we developed the Food Disgust Picture Scale (FDPS). This eightpicture tool can be used in complement to or as replacement for text-based measures. In Study 1 (N = 57), we constructed a scale consisting of eight pictures that proved powerful in the assessment of food disgust sensitivity. The basic structure of the FDPS was replicated in Study 2 (N = 538). Correlational analyses using the Food Disgust Scale, a revised version of an established disgust scale, and a food neophobia scale supported its validity. Study 3 (N = 227) used a test-retest design to demonstrate the short-term stability of the FDPS. This short and comprehensive measure using pictures as disgust elicitors that work independent of language may significantly facilitate intercultural research on food disgust.

## **Poster 24-0**

### **Bacterial spore control by high pressure processing as key for sustainable and high quality food sterilization**

Yifan Zhang, Alex Waser and Alexander Mathys  
Sustainable Food Processing, ETH Zurich

#### **ABSTRACT**

High pressure processing (HPP) has been investigated as a promising non-thermal food processing with high nutrient retention. However, so far most HPP food in the market are not sterile due to a resistant sub-population of bacterial spore. This research focus on investigating this sub-population, to realize the delivery of high quality sterile foods that has long shelf-life even under ambient distribution.

Spores of *Bacillus subtilis* were treated at 150 MPa or 600 MPa, 40°C or 60°C. Spores that did not inactivated after a treatment were isolated by flow cytometry cell sorting and further investigated. Results revealed that the process parameters of HPP and the spore properties influence the spore resistant to HPP. Possible combination of treatments that can increase spore inactivation was also found. This provides information for constructing potential HPP combined spore control approaches, which will contribute to the delivery of safe, high quality sterilized foods.

## **Poster 25-0**

### **Assessing and enhancing the resilience of the tef and cocoa value chains in Ethiopia and Ghana**

Jonas Joerin, Pius Kruetli, Kenza Benabderrazik, Evans Dawoe, Kebebew Assefa, Samuel Hauenstein, Johan Six  
Climate Policy, ETH Zurich; TdLab, ETH Zurich; Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

Through a transdisciplinary research approach, we compare the tef (food security crop in Ethiopia) and cocoa (cash crop in Ghana) value chains. Using drought, heavy rainfall (in Ghana) and untimely rainfall (in Ethiopia) as potential shocks, we conducted a survey to determine the resilience of organizations located at different (input supply, production, processing, retailing and consumption) activities in both value chains to deal with these shocks. Results indicate that organizations who experienced these shocks tend to be more resilient (e.g. affordability of inputs, access to early-warning information, etc.) compared to those without experience. We currently develop scenarios together with stakeholders in both countries to identify measures and strategies to build resilience against these shocks.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>. It is part of the WFSC Flagship Project Enhancing Resilience in Food Systems: <http://www.resilientfoodsystems.ethz.ch>

## **Poster 26-0**

### **Assessing tomato farmers' resilience to market influences and climate change events - A comparative study between Morocco and Ghana**

Kenza Benabderrazik, Johan Six, Jonas Joerin, Birgit Kopainsky  
Sustainable Agroecosystems, ETH Zurich

#### **ABSTRACT**

In a context outlined by globalization of agricultural commodity markets and climate change, farmers are increasingly more subject to disturbances and shocks, hence the need to build farmers' resilience. Drawing on empirical studies, this doctoral thesis will focus on the case of tomato production to exemplify this complex interplay between producers, traders, environment and global markets. Morocco, where tomatoes constitute one of the main agri-food exports, and Ghana, where this cash crop serves as a domestic dietary staple, will serve as comparative case study locations. In both cases, market influences, such as price volatility, and the impact of intensive production on environmental resources, such as water scarcity, all contribute to difficulties farmers face in being resilient and in upholding a sustainable livelihood. Ultimately, the study will lead to the identification of mechanisms and opportunities to enhance the resilience of tomato farmers in both countries.

This project is part of the WFSC Flagship Project Enhancing Resilience in Food Systems: <http://www.resilientfoodsystems.ethz.ch>

## Poster 27-0

### **Bioenrichment of iru: A fermented vegetable protein**

Afolake Olanbiwoninu, Christoph Jans, Anna Greppi, Christophe Lacroix  
Food Biotechnology, ETH Zurich

#### **ABSTRACT**

African locust bean (*Parkia biglobosa*) cotyledon is fermented in Nigeria to produce a soup condiment known as iru. Fermentation of iru is brought about by *Bacillus subtilis*. Specific strains of *B. subtilis* have the ability to produce riboflavin at high quantities. Riboflavin is an essential component of basic cellular metabolism in humans but is lacking in the diet of the rural population of Nigeria leading to riboflavin deficiencies. This project aims to identify *B. subtilis* strains to produce elevated riboflavin quantities for bioenrichment during iru fermentation.

A total of 118 of *Bacillus* were isolated from traditional iru and identified as *Bacillus subtilis* (37), *B. licheniformis* (34), *B. megaterium* (9), *B. pumilus* (31), and *Bacillus* sp. (7). Promising candidates (22) producing over 50 mg/L were obtained and will undergo further strain and fermentation improvement to achieve bioenrichment of riboflavin in iru.

## Poster 28-0

### **Biofortification of staple cereals – addressing micronutrient deficiencies affecting human health**

Yuta Kawakami, Simrat Pal Singh, Ting Ying Wu, Kulaporn Boonyaves, Wilhelm Gruissem, Navreet Bhullar  
Plant Biotechnology, ETH Zurich

#### **ABSTRACT**

Micronutrient deficiencies, especially those of iron, zinc and vitamin A, are prevalent worldwide and are among the most critical challenges to human health today. Biofortification, an attempt to increase the micronutrient concentration within the edible parts of the crops, holds a great potential for addressing micronutrient deficiencies. By introducing multiple exogenous genes that contribute to iron uptake, transport and storage into one locus, we have developed rice and wheat lines that have significantly increased concentration of iron and zinc. Furthermore, by introducing pro-vitamin A synthesis genes together with the genes for iron and zinc biofortification into one locus, we have created rice lines with high provitamin A concentration in the grains besides high iron and zinc concentrations. We continue to optimize our strategies to transfer improved grain micronutrient traits to breeding preferred cultivars and we are also developing novel biofortification approaches involving state-of-the-art gene-editing technologies.

## Poster 29-0

### **DROSOPHRISK- Evaluation of risk management strategies and damages**

Ladina Knapp, Esther Bravin, Manuela Meraner, Dominique Mazzi, Robert Finger  
Agricultural Economics and Policy, ETH Zurich; Agroscope

#### **ABSTRACT**

The strategies taken by farmers to cope with production risks differ largely across time and space, ranging from preventive to control strategies. In this project, we aim to identify the determinants of risk management behavior. More specifically we aim to identify the relevance of farm, farmer and household specific characteristics, e.g. farmers' risk perception and risk preferences, as well as the effects of advisory services and communication tools. Our case study focuses on the management of infestation with spotted-wing drosophila (*Drosophila suzukii*) in Swiss stone fruit, berry and grapevine production.

To this end, we conduct surveys with growers of different crops throughout Switzerland. These surveys are repeated over three years, enabling the creation of rich panel data sets. Our goal is to provide more targeted recommendations and thus contribute to developing better policies to cope with these risks.

## Poster 30-0

### **Prerequisites for subsequent CRISPR-Cas9-assisted engineering of a *Lactobacillus sakei* meat starter strain**

Jans, C., Lacroix, C., Meile, L.  
Food Biotechnology, ETH Zurich

#### **ABSTRACT**

*Lactobacillus sakei* FAM18311 originates from fermented meat, featuring promising technological properties. We aimed to establish a *Lb. sakei* strain for metabolic studies via novel genetic tools. Therefore, FAM18311 was characterized via genome sequencing using the PacBio RS Platform. FAM18311 featured a 1,945,884-bp main chromosome and two presumptive plasmids. Genomic distance calculations clustered FAM18311 with two other meat isolates, separated from other meat, kimchi and sake isolates. Stratified by strain origin (meat vs plant), FAM18311 harbored an additional 61 coding sequences (CDS) shared only with a single, distantly related kimchi isolate. No presumptive antibiotic resistance gene was detected and tyramine production was predicted to be absent leaving no obvious food safety concerns. No CRISPR arrays or Cas9 proteins were observed as defensive mechanisms against foreign DNA. Conclusively, *Lb. sakei* FAM18311 seems to be mostly comparable to other *Lb. sakei* strains but provides interesting targets and controls for CRISPR-Cas9 engineering.

## Poster 31-0

### **The African dairy fermentation system – novel adapted bacteria for food production?**

Dasel Wambua Mulwa Kaindi, Wambui Kogi-Makau, Godfrey Nsereko Lule, Bernd Kreikemeyer, Pierre Renault, Bassirou Bonfoh, Esther Schelling, Jakob Zinsstag, Nize Otaru, Thomas Schmid, Christophe Lacroix, Leo Meile, Jan Hattendorf, Christoph Jans Food Biotechnology, ETH Zurich

#### **ABSTRACT**

Many African fermented dairy products are predominated by dairy adapted variants of *Streptococcus infantarius* subsp. *infantarius* (Sii) that parallel adaptation of the yoghurt bacterium *Streptococcus thermophilus*. Sii could provide a new opportunity for food production in Africa, but require a safety assessment due to possible links with colorectal cancer and infective endocarditis in humans. We aimed to investigate the population structure of Sii of food origin in Africa, Asia and Latin America to those obtained from Kenyan colonoscopy patients, Kenyan infant faeces, human blood and animals. One of 33 Sii clustered with presumed pathogenic Sii strains obtained from blood cultures. The remaining 32 rectal swab Sii clustered with Sii from human faeces from Kenyan infants and West African dairy products, separated from East Africa dairy Sii. Phylogeny suggests the evolution of a specific East African Sii dairy lineage likely relevant for local dairy fermentation for millions of daily consumers.

## Poster 32-0

### **Identifying sources and variability of iodine in cow's milk to ensure adequate dietary iodine intakes by the Swiss population**

van der Reijden, O.L., Galetti, V., Hulmann, M., Krzystek, A., Haldimann, M., Schlegel, P., Manzocchi, E., Berard, J., Kreuzer, M., Zimmermann, M.B., Herter-Aeberli, I. Human Nutrition, ETH Zurich; Animal Nutrition, ETH Zurich; Swiss Federal Food Safety and Veterinary Office; Agroscope Posieux

#### **ABSTRACT**

Main dietary iodine sources in Switzerland are iodized salt (>50%) and dairy products (~30-40%); however, milk iodine concentration (MIC) varies widely, making milk an unpredictable source. We aimed to: 1) survey the MIC from Swiss farms to determine the main predictors of MIC; and 2) establish the dose-response relationship of iodine in feed and milk feeding a forage-based diet. Significant predictors of MIC were farm type (conventional>organic,  $P<0.05$ ), season (September<December/March,  $P<0.002$ ) and disinfection with iodine containing disinfectants ( $P<0.05$ ). The relationship between dietary and milk iodine is linear ( $r^2>.90$ ). MIC is  $\approx 150\mu\text{g}/\text{kg}$  at a dietary iodine concentration of 1 mg I/kg DM diet of the cow, and consumption of 213g/d would contribute 25% to the daily iodine requirements at this concentration. A more standardized delivery of iodine through milk and dairy products could be complementing other strategies such as universal salt iodization to avoid iodine deficiency or excess in a population.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## **Poster 33-0**

### **Modeling of solar drying of fruit using a multiscale approach**

Kevin Prawiranto, Thijs Defraeye, Dominique Derome, Jan Carmeliet  
Building Physics, ETH Zurich; Empa

#### **ABSTRACT**

Solar drying of fruit is considered as a cost-effective and environmentally-friendly drying technique. However, the fluctuations in incident solar radiation slow down the drying rate and negatively affect the product quality. Installation of heat storage, air dehumidification and auxiliary heating are commonly used to mitigate such fluctuations. In this study, a multiscale approach is adopted to examine the response of a piece of fruit to variations in the drying conditions, induced by solar-drying, in order to quantify the impact of the mitigation methods. The macroscopic transport properties of the fruit tissue, such as moisture permeability and sorption isotherm, are derived from microscale modelling of the fruit cellular structure. Those properties are used in a continuum model at the fruit scale, in which heat and mass transfer are solved together with the fruit deformation and quality. We found that controlling the air humidity is the most effective way to optimize the solar drying process.

## **Poster 34-0**

### **Soft matter approach to effective preservation of African Leafy Vegetables (ALVs) by drying: SoLVeD**

Leonie van 't Hag, Raffaele Mezzenga  
Laboratory of Food and Soft Materials, ETH Zurich

#### **ABSTRACT**

ALVs are indigenous plants in sub-Saharan Africa. They are rich in nutrients and for this reason they play an important role in the dietary intake of vitamins and minerals of local populations. They are highly liable to spoil once harvested, however, and an effective and affordable preservation method is urgently needed. One approach is the use of a desiccant such as superabsorbent polymers (SAP): these polyelectrolyte networks are well-known for their capacity to absorb large amounts of water. To date the moisture sorption isotherms of fresh and rehydrated leaves of five ALV species were determined and the maximum microbially safe moisture content for storage was calculated based on modelling of these results. Additionally the effect of drying on the microstructure of the leaves was investigated to explain changes in moisture of fresh and rehydrated leaves.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.



## Poster 35-0

### **Characterization of *Lactobacillus reuteri* isolates to inhibit *Campylobacter* colonization in chicken**

Paul Tetteh Asare, Anna Greppi, Clarissa Schwab, Christophe Lacroix  
Food Biotechnology, ETH Zurich

#### **ABSTRACT**

Campylobacteriosis is the most frequently reported food-borne illness in EU. Reuterin is an antimicrobial produced by *Lactobacillus reuteri* from glycerol. Since *L. reuteri* forms stable biofilms in the crop and reuterin can inhibit enteropathogens such as *Campylobacter*, our aim was to isolate from chicken *L. reuteri* producing reuterin to reduce *Campylobacter* contamination in vivo. 200 strains were isolated from Swiss chicken. Seventy isolates were confirmed as *L. reuteri*, with 31 clonal isolates. Fifty-five isolates were pduC positive and showed reuterin production from 500 mM glycerol in the range from 53 to 224 mM. All *L. reuteri* isolates were resistant to tetracycline and vancomycin and some to ampicillin, cefatoxime, ciprofloxacin, erythromycin, impenem, penicillin, sulfamethoxazole and tetracycline. The MIC and MBC of reuterin against panel of campylobacter isolates were between 20 – 156 mM. Reuterin production is a common feature of *L. reuteri* strains in chicken, with potential to inhibit *Campylobacter* growth.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## Poster 36-0

### **Color loss kinetics of the functional microalgae protein phycocyanin under short time micro processing**

Lukas Böcker, Jakob Surber, Elena Leeb, Kai Reineke, Alexander Mathys  
Sustainable Food Processing, ETH Zurich

#### **ABSTRACT**

Phycocyanin derived from *Arthrospira platensis* is the only naturally sourced blue food colorant. Thermal treatments commonly applied in food industry impact the functional protein's color activity. This study investigated color-loss in batch and continuous high-temperature-short-time treatments obtaining heat inactivation kinetics.

Phosphate buffered phycocyanin (0.1M, pH7.3) was processed in thin capillaries (batch) and in a modular micro reactor system (MMRS). In- and online process control and high surface to volume ratios allowed controlled temperature-time treatments between 60-80°C with holding times of 5-60sec. Concentrations of color active phycocyanin were derived with UV/VIS-spectrophotometry indicating a biphasic degradation. The decay reaction kinetics were modelled with TableCurve2D providing velocity constants for 1<sup>st</sup> and nth order kinetics with best fit for nth-order 4.8 by applying cumulative standard error analysis.

However, no model could sufficiently describe the complete experimental decay data demonstrating the limitations of classical 1<sup>st</sup> and nth-order reaction kinetics and question their universal application to heat degradation processes of proteins.

## Poster 37-0

### **Two types of resistance against a major wheat disease – Protection from *Septoria tritici* blotch is achieved by suppressing host damage and pathogen reproduction separately**

Petteri Karisto, Andreas Hund, Kang Yu, Jonas Anderegg, Achim Walter, Fabio Mascher, Bruce A. McDonald, Alexey Mikaberidze  
Plant Pathology, ETH Zurich

#### **ABSTRACT**

*Septoria tritici* blotch (STB) caused by *Zymoseptoria tritici* is a major disease of wheat in Europe. Breeding for quantitative resistance promises to lead to more durable disease control but is limited by difficulties in recognising quantitative differences between cultivars. We used automated image analysis on a collection of 21420 naturally infected leaves from 335 elite European winter wheat cultivars. We obtained precise and objective quantitative measures of conditional STB intensity that allowed us to separate resistance affecting host damage from resistance affecting pathogen reproduction. The cultivar rankings differed between the two measures, indicating that the two forms of resistance should be considered separately in breeding programs. We showed that measures of pathogen reproduction early in the season were the best predictors of host damage late in the season, illustrating the importance of breeding for resistance against pathogen reproduction in order to suppress epidemics and minimize yield losses caused by STB.

## Poster 38-0

### **Non-thermal plasma as a sustainable intervention technology to improve shelf life and safety of sprouted seeds**

Waskow, A., Betschard, J., Butscher, D., Oberbossel, G., Loessner, M.J., Rudolf von Rohr, P., Schuppler, M.  
Food Microbiology, ETH Zurich

#### **ABSTRACT**

The increasing consumption of fresh fruit and vegetable products contributes substantially to consumers' health. However, inherent to all minimally processed products is the short shelf life, resulting in high product loss, and the risk of foodborne illness. In particular sprouts are frequently involved in outbreaks of foodborne diseases, because the conditions during the sprouting process heavily favour the growth of seedborne microorganisms. Thus, the current lack of an effective but sustainable seed disinfection technology demonstrates the urgent need for alternative treatment technologies in sprout production in order to guarantee food safety and prolonged shelf life. Cold atmospheric pressure plasma (CAP) represents such a novel approach, because it effectively inactivates different kinds of microorganisms without the use of hazardous chemicals. The application of CAP revealed promising results as it allowed efficient decontamination of seeds, while maintaining or even improving germination properties of treated seeds and preserving the quality of the resulting sprouts.

This research is supported by the WFSC Coop Program. Further information is available at <http://www.worldfoodsystem.ethz.ch/research/CRP>.

## Poster 39-0

### **Impact of trees on mycorrhizal abundance and soil fertility in low-input maize cropping systems**

Dierks, J., Blaser, W.J., Gamper, H.A., Six J.  
Sustainable Agroecosystem, ETH Zurich

#### **ABSTRACT**

Trees in African low-input cropping systems could play a vital role in maintaining arbuscular mycorrhizal fungi (AMF) and as such, improve crop nutrient uptake and soil fertility. The benefits of trees on soil fertility are established but the role of tree-facilitated AMF in enhancing soil fertility is understudied. We investigate whether trees maintain AMF during the non-cropping season and help improve soil fertility in Malawian farmers' maize fields. Results show soil structure, carbon, and nitrogen decrease with distance from mango trees (*Mangifera indica*). AMF abundance is greatest at intermediate distances from faidherbia trees (*Faidherbia albida*) but there is no effect on maize performance. Our preliminary results suggest that mango trees improve soil fertility in their vicinity while faidherbia trees appear to impact soil properties beyond 15 meter. In general, this study will provide insight into the potential of tree-facilitated AMF to enhance sustainability of maize cultivation in low-input cropping systems.

## Poster 40-0

### **Tracking pesticide fate in conventional banana cultivation in Costa Rica: A disconnect between protecting ecosystems and consumer health**

Annelle Mendez, Carla Ng, Konrad Hungerbueler  
Safety and Environmental Technology, ETH Zurich

#### **ABSTRACT**

Despite the high pesticide inputs used their cultivation, Costa Rican export bananas rarely contain residues above safety levels for consumer health. However, in producing regions, pesticides have regularly been detected in surface waters and human matrices, at levels associated with adverse effects on humans and biota, including massive fish kills. Most studies on pesticide residues in the Costa Rican environment are snapshots, resulting in scattered insights on pesticide fate and transport to inform risk mitigation. To help bridge this gap, we created a dynamic multimedia model that estimates pesticide concentrations in water, air, soil, sediments, and banana plants in the Caño Azul River Watershed. Results for the herbicide diuron, the nematicide ethoprosfos, and the fungicide epoxiconazole show that concentrations in fruit are below maximum residue limits. However, concentrations in water are highly variable and often exceed thresholds for ecosystem health, particularly at peak runoff events driven by emissions and rainfall.

**Poster 41-0**

**A novel, high precision multiple-meal stable isotope method to compare iron absorption from extruded FePP-fortified rice containing different zinc compounds, citric acid/trisodium citrate and EDTA in Ghanaian children**

Laura Hackl, Abdul-Razak Abizari, Helen Zhungbey, Christophe Zeder, Cornelia Speich, Colin I. Cercamondi, Michael B. Zimmermann, Diego Moretti  
Human Nutrition, ETH Zurich; Department of Community Nutrition, University for Development Studies, Tamale, Ghana

**ABSTRACT**

Rice fortification can be a viable approach to combat iron deficiency in rice-consuming populations, but formulations with high iron bioavailability and acceptable sensory properties are needed. Ferric pyrophosphate (FePP) is the only iron compound resulting in sensory acceptable iron fortified rice grains. We measured fractional iron absorption (FAFe) from isotopically labeled FePP in a cross-over multiple meal absorption study. Fortified extruded rice meals either contained: zinc-oxide (ZnO;  $^{54}\text{FePP}+\text{ZnO}$ ), zinc-sulphate ( $\text{ZnSO}_4$ ;  $^{57}\text{FePP}+\text{ZnSO}_4$ ), alone or in combination with a citrate-buffer CA/TSC ( $^{54}\text{FePP}+\text{ZnO}+\text{CA/TSC}$  or  $^{57}\text{FePP}+\text{ZnSO}_4+\text{CA/TSC}$ ) or ZnO, CA and edetate (EDTA;  $^{58}\text{FePP}+\text{ZnO}+\text{CA}+\text{EDTA}$ ). Iron depleted Ghanaian school-age children with and without anemia (N=26) were fed six different iron-fortified rice meals over the course of six weeks (twice daily for five consecutive days). FAFe was compared from all meals versus non-extruded rice with highly bioavailable  $^{58}\text{FeSO}_4$  (reference). Meals containing  $^{57}\text{FePP}+\text{ZnSO}_4+\text{CA/TSC}$  and  $^{58}\text{FePP}+\text{ZnO}+\text{CA}+\text{EDTA}$  can potentially mitigate iron deficiency in rice-eating populations while maintaining sensory properties acceptable for rice consumers.

## **WFSC Poster**

### **Delivering Food Security on Limited Land**

Anna K. Gilgen, Jonna Cohen, Michelle Grant, Nina Buchmann, and DEVIL Consortium Members  
World Food System Center, ETH Zurich

#### **ABSTRACT**

The challenge of delivering food and nutrition security now and in the future on limited land area is one of the greatest current challenges. The DEVIL project (short for Delivering Food Security on Limited Land) uses models to envision solutions to this challenge and demonstrates their viability by examining feedbacks and interactions between land use change and food security dynamics. Consortium partners will build an integrated modeling system based on high resolution, spatially disaggregated global models and databases of soils, land use, crops and livestock; the global FEEDME model; and a new country-level agent-based model.

The World Food System Center leads the knowledge exchange, engagement, and outreach activities for the DEVIL Consortium. We support Consortium partners in the development of outreach products and with exchange platforms. To engage advanced students from around the world with the project and its output, the WFSC organizes two intensive summer school training programs.

Further information is available at <http://deliveringfoodsecurity.org/>.

## **WFSC Poster**

### **Edible Research: Hands on Learning for Sustainability in Agroecosystems**

Anett Hofmann, Anna K. Gilgen, Martina Carrel, Manuel Stamm, Simon Treier, Luna Urio, Michelle Grant, Johan Six  
Sustainable Agroecosystems, ETH Zurich; World Food System Center, ETH Zurich

#### **ABSTRACT**

The new teaching curriculum for Swiss primary and secondary schools, Lehrplan 21, defines several objectives related to sustainability, consumption patterns, and global food systems. A focus on food and drinks is one of the suggested gateways to addressing sustainable development at schools. Edible Research offers workshops for teenagers aged 12 to 15 from lower secondary schools in Zurich to open a window to the world of agricultural ecosystems and their tasty products. All workshop contents are related to ongoing agroecosystem research projects and focus on how basic principles of agroecology and organic farming can help to produce food in a more sustainable way. This educational program aims to help teenagers to better understand their role as consumers and food system actors. The project contributes to Education for Sustainable Development by facilitating dialogue on research for sustainable food systems between teenagers, teachers, agricultural sciences students and scientists.

Further information is available at <http://www.worldfoodsystem.ethz.ch/outreach-and-events/dissemination-and-participation/agora.html>.

## **WFSC Poster**

### **Living Lab for Sustainable Campus Catering**

Bastian Flury, Patrick Jiranek

World Food System Center, ETH Zurich; ETH Sustainability, ETH Zurich

#### **ABSTRACT**

University campus catering exhibits many challenges that are also symptomatic for the wider food system. The majority of students are on a tight budget, so price elasticity is low. To be sustainable, catering on campus should be environmentally conscious while providing adequate nutrition for all, regardless of their socioeconomic status. For that reason, the World Food System Center and ETH Sustainability launched the project “sustainable catering at ETH Zurich” in 2013. The project adopts a “living lab” approach, which intrinsically acknowledges change not as unilateral action but as a transformation process. By doing so, the project initiated an inclusive process that brought together all stakeholders in campus catering at ETH Zurich. In collaboration with a catering service company, the project engaged students in the development of real-world solutions and interdisciplinary, research-based learning by transforming canteens on ETH Zurich-campus temporarily into “living labs”. The final report of the project is now available, a joint publication of ETH Seed Sustainability (lead: Patrick Jiranek) and the WFSC (lead: Bastian Flury).

Further information is available at

<https://www.ethz.ch/en/the-eth-zurich/sustainability/education/seed-sustainability/laufende-projekte0/nachhaltige-gastronomie-an-der-eth-zuerich-.html>.

## **WFSC Poster**

### **World Food System Summer School-From the Perspective of our Alumni**

WFSC Alumni

World Food System Center, ETH Zurich

#### **ABSTRACT**

The cornerstone of the WFSC’s educational activities is the “World Food System Summer School” program that each time brings together 20-25 students from ETH Zurich and universities from around the world for a 16-day intensive course on food systems.

Between 2013 and 2017, this course took place six times, four times at a pioneering organic farm in the Canton of Zurich (Gut Rheinau), once in India, and once in South Africa. The 4-unit course incorporates a variety of innovative teaching formats, such as first-hand exchanges with stakeholders and practitioners, group work, concept mapping, policy impact analysis, business planning exercises, panels, and hands-on practical applications. Instructors include ETH Zurich faculty, international researchers, and practitioners from industry, public, and non-profit sectors. This approach ensures the courses balance academic content and rigor with an immersion and experiential learning context. Solution-approaches in multidisciplinary and multicultural teams are a key component.

Further information is available at <http://www.worldfoodsystem.ethz.ch/education>.

## **WFSC Poster**

### **World Food System Center Communications**

Jeanne Tomaszewski, Jukka Nyström  
World Food System Center, ETH Zurich

#### **ABSTRACT**

The goal of our communication is to create visibility around WFS activities and contribute expertise to public dialogue. To this end, the Center website is regularly updated with news from members' research and media appearances. Such news is also cross-posted on our Facebook and Twitter pages with additional WFS events, opportunities, and media shared with the interested public. Our newly launched LinkedIn group "World Food System Center, ETH Zurich" aims to connect students and professionals who are interested in working towards sustainable food systems. All of our media outlets allow timely updates of events, information, and research from the WFSC.

Visit us at

<http://www.worldfoodsystem.ethz.ch/>

<https://www.facebook.com/ethzWFSC/>

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Layout

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