

#### THE WFSC AT ETH ZURICH

The question of how to feed the world in a way that ensures human health, environmental sustainability, and social well-being is one of the defining and most complex global challenges of our time. In order to play a leading role in addressing this challenge, ETH Zurich (Swiss Federal Institute of Technology) established the World Food System Center (WFSC) in 2011.

The WFSC directly implements the mandate of ETH Zurich - Education, Research, Knowledge and Technology Transfer and Service to Society - with regard to tackling food system challenges. We act as a platform that brings members together to collaborate across disciplines and with a variety of external partners. Our work builds on an understanding that solutions to food system challenges require collaboration from stakeholders across the entire food value chain. Thus, our programs bring opportunities to students, scientists, and professors who are concerned with food systems in their research and encourage creative approaches to engage with a wide range of stakeholders.



Cover Image: The AERTCvc project aims to assess and enhance the resilience of the cocoa value chain in Ghana. The project is part of the Flagship project "Enhancing Resilience in Food Systems."





#### DEAR COLLEAGUES, PARTNERS, ALUMNI, AND FRIENDS,

Our Center was established based on two main convictions. First, we need real-world solutions to tackle the challenges our food system faces. Second, collaboration with global and local stakeholders across the entire food value chain is essential for sustainable solutions. This report highlights a selection of projects and activities we have worked on over the last year. They are good examples of how we, in collaboration with many partners, contribute to the development of solutions that are of practical relevance.

On the next page, you get a first overview of the highlights from 2017. It shows the broad range of activities in research, education, and outreach that we plan, develop, and execute together with our over 40 members. We are happy to support over 30 doctoral students and postdoctoral researchers in the dissemination of their research results and hence our collaborative contribution to valuable communication with the public. The impressive collaboration during our Summer Schools, for example the one in South Africa in 2017, is the foundation of strong ties with a network of over 150 students and young professionals from all over the world. All three running Flagship projects conducted workshops last year. They are key to foster the exchange among researchers as well as between science, industry, and society.

Everything that the Center represents today is the result of a strong teamwork. Two key members of our team left their positions last year. Michelle Grant stepped down as Executive Director and Prof. Nina Buchmann resigned as Chair. We are grateful for their vision, perseverance, and passion. Their efforts were key to establish and develop the Center. We are happy that both, in different roles, are still working with us.

All our activities, in the past but also in future, are only possible due to our powerful and reliable network of partners and collaborators. We are grateful for the partnerships with stakeholders like you. We look forward to continuing our existing collaborations and activities and to establishing new ones.

Together, we will contribute to a healthy world through a sustainable food system.

Michael Siegrist

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Chair

Martijn Sonnevelt Executive Director

Merkjufoutt

# YEAR IN REVIEW

Highlights from the Center's work in its three main activity areas of research, education, and outreach.





Public lecture on effects of weather shocks on migration by Prof. Wolfram Schlenker



'Sustainable Nutrition with Bits and Bytes" exhibit at ETH/UZH Scientifica



Stakeholder workshop "Animal Feed Production from Biowastes



Public lecture Tackling Malnutrition with Biofortification" Keynote: Dr. Maria Andrade



2nd Stakeholder workshop "Resilience of the Tef Value Chain in Ethiopia"

WFS Summer School "Food Systems in Transition" in South Africa



**SEPTEMBER** 

Global Challenges Debate Series at Queen's University Belfast



Delivering Food Security on Limited Land Annual Project Meeting in South Africa

Stakeholder workshop "New coldchain and packaging technologies to reduce food losses"



**AUGUST** 

Edible Research Pro Juventute "Ferienplausch" summer camps



**OCTOBER** 

**NOVEMBER** 

**DECEMBER** 



IngCH Engineering and Computer Science Week at Kantonsschule Büelrain



2nd Stakeholder workshop "Resilience of the Cocoa Value Chain in Ghana"



PubliFarm special exhibit at the OLMA Swiss Fair for Agriculture and Nutrition



WFSC Research Symposium

## THE CENTER

#### A healthy world through sustainable food systems.



THE CHALLENGE

In the coming decades, our food system will face unprecedented challenges in its ability to feed and nourish the world. Discourse on the global challenge of food security has historically mostly focused on how we will grow enough food. This focus, however, overlooks the fact that achieving food and nutrition security requires more than just producing enough calories for all; we also need to ensure access for each individual to a quality and safe diet with adequate macro- and micronutrients. Overweight and obesity are widespread while micronutrient deficiencies affect billions, creating a triple burden of malnutrition in many emerging countries.

Further adding to these challenges, the environmental basis for food and agricultural production is facing unprecedented strain from phenomena such as climate change, deterioration of soil quality, resource scarcity, and emerging pests and pathogens. At the same time, the world's remaining arable land is increasingly subject to competing uses and interests, such as biofuel production, residential and industrial development, and animal feed production.

At the WFSC, we believe this discourse, and the design of appropriate solutions to ensure food and nutrition security both now and in the future, would benefit from a broader adoption of a food systems approach that allows building resilient food systems capable of providing food and nutrition security over the long term.

#### **OUR APPROACH AND MISSION**

The world food system is a complex, interconnected system, making designing interventions challenging, as it is difficult to predict outcomes and anticipate all unintended consequences. Typically, no single solution or disciplinary approach appropriate for all levels and contexts exists. Instead, a food systems approach requires inter- and transdisciplinary methods that have the ability to consider activities, outcomes, interactions, as well as feedbacks and engage all relevant stakeholders.

The Center takes a food systems approach because we believe we will be most successful when experts from different fields bring their diverse experiences to work together collaboratively to design appropriate interventions that positively support food system outcomes. Such collaborations require new tools and new ways of thinking and working together.

Our mission is to be a leader in scientific research, education, and outreach across the food system that contributes to the key challenges of food and nutrition security, environmental health, and social well-being. We strive to act as a platform to bring together our members' multidisciplinary expertise with strategically relevant external partners, fostering collaborative environments and providing the leadership and foresight needed to create innovative solutions.

Our core values dictate the (1) importance of academic independence and include a commitment to (2) sustainability, (3) transparency, (4) objectivity, (5) inter- and transdisciplinarity, (6) real world impact through partnerships, and (7) addressing global challenges of societal relevance.

# Environmental Boundary Conditions Social Boundary Conditions Political Boundary Conditions Economic Boundary Conditions Resources Agricultural Processing Retailing Consumption Physiological Response Waste & Losses

Outcomes: Food and Nutrition Security (Availability, Access, Use, Resilience), Environmental Quality, Social Well-being

The Key Elements of the World Food System



NEW MEMBER GROUP PROFILE

#### ORGANIZATIONAL STRUCTURE

The core of the WFSC is formed by the member group, which in 2017 comprised 40 professors from eight different departments of the ETH Zurich and three different groups of Eawag. The Steering Committee, formed by a group of ten elected members and led by a Chair, oversees the strategy and operational functions carried out by the Executive Office. The Scientific Advisory Board of six external advisors provides strategic advice to the Steering Committee and connections to key external organizations. The Partnership Council is formed by foundations and industry partners who make substantial donations to the programs of the Center through the ETH Zurich Foundation.

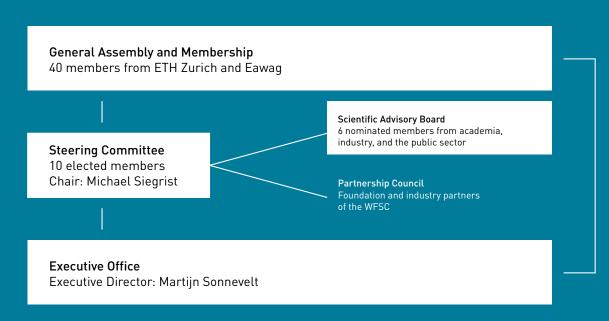
Prof. Ruben Kretzschmar has led the group of Soil Chemistry at ETH Zurich since 1999. The group works to understand the soil chemical processes controlling nutrient and contaminant behavior in terrestrial ecosystems in order to sustain soil quality and food security. Currently, his group focuses on the behavior of metals in periodically flooded or water-saturated soils, such as contaminated river floodplains and irrigated rice paddy fields. With respect to food production, his group investigates soil



and rhizosphere processes controlling the uptake of cadmium and arsenic by rice grown in contaminated paddy soils.

«The WFSC fosters interdisciplinary collaborations and exchange of ideas and knowledge, which is essential for tackling highly complex problems of locally adapted and sustainable food production.»

Prof. Ruben Kretzschmar



WFSC Organizational Structure

#### PARTNERSHIP APPROACH

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

In close collaboration with the ETH Zurich Foundation, we established our strategic partnership network specifically to engage with industry and foundation partners who support our vision and mission through programs and projects. It aims to (1) provide a platform for exchange and news, (2) give partners a first-hand insight into new science and developments at ETH Zurich, and (3) discuss new pre-competitive projects and collaborations. The strategic partnerships of the WFSC are coordinated through our Partnership Council, which meets as a group twice per year. The current Partnership Council members are Mercator Foundation Switzerland, Coop, Bühler, Migros, Fenaco, Nestlé, and Syngenta.

Our collaborative partners are organizations that the WFSC works with regularly who bring important and complementary expertise and networks to the table. Collaborative partnerships allow us to work together with stakeholders in a way that creates added value for both organizations without engaging in a permanent relationship involving binding commitments. In addition, the WFSC facilitates partnerships at the project level among academia and external partners and stakeholders from a variety of different sectors.



STIFTUNG MERCATOR SCHWEIZ













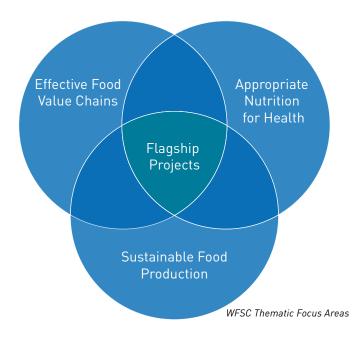
## RESEARCH

Enabling new interdisciplinary research that contributes knowledge and solutions to the food system challenge of how to secure food and nutrition security for all in a socially and environmentally sustainable way.

# THEMATIC RESEARCH FOCUS AREAS

The Center adopts a systems perspective to its research that takes place within interlinked thematic research focus areas. These focus areas guide the Center's research initiatives and connect it to food system challenges of societal relevance. With our work, we contribute directly to eight of the United Nations Sustainable Development Goals, including Zero Hunger, Sustainable Consumption and Production, and Good Health and Well-Being.

The three interlinked thematic research focus areas are Effective Food Value Chains, Appropriate Nutrition for Health, and Sustainable Food Production. Resilience and resource efficiency are core concepts for the Center's work on food value chains and food production systems. Diversity and safety are underlying principles for our work on food production and appropriate nutrition. Our Flagship research projects showcase our food system approach and tackle large questions at the intersection of the focus areas, where ETH Zurich is uniquely positioned to contribute to solutions for the world's pressing challenges.



#### RESEARCH PROGRAMS

The Center's Research Programs support new cross-disciplinary and solution oriented research to address food system challenges, with 30 projects totaling nearly 8 million CHF funded to date. All projects are subject to a rigorous evaluation by an independent academic panel with additional external reviews and an assessment process that takes into account scientific excellence and relevance to the programs. To fund these programs, we established the World Food System Grants Platform, which allows for working with industry and foundation partners in a pre-competitive way that ensures academic independence and industry relevance. The final funding decisions lie with the ETH Zurich VP for Research and Corporate Relations. Learn more at <a href="https://www.worldfoodsystem.ethz.ch/research">https://www.worldfoodsystem.ethz.ch/research</a>.

Year of Grant Call	2011-2016	2017	Total
Projects supported	27	3	30
Funding dispursed (kCHF)	7'219	745	7'964

Our 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, funded by the Mercator Foundation Switzerland, was initiated in 2011 and 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. To date, 14 projects that include 16 doctoral students have been funded. The Coop Research Program, supported by the Coop Sustainability Fund, was initiated in 2013 for research that addresses challenges and opportunities for sustainability in food value chains. The program aims to provide knowledge necessary to drive food value chains towards goals of quality and quantity that support human and environmental health and create value for all stakeholders. To date, 15 postdoctoral research projects have been supported.

PROJECT UPDATE



Zinc deficiency is a global human malnutrition problem, with an estimated sixth of the world's population at risk of inadequate zinc intake. The project "Zinc biofortification of wheat through organic matter management in sustainable agriculture" (ZOMM) investigates how organic matter can be used best in agricultural soil management to enhance the nutritional quality of wheat grains with respect to zinc density, while at the same time promoting soil fertility.

The project team's results show the potential of using clover and mustard green manure crops to increase soil zinc uptake by wheat and inoculating soil with zinc-solubilizing bacteria to increase availability of zinc to plants, thereby enhancing crop growth and nutritional quality.

Four scientific journal articles highlighting results from the project are published thus far, and Roman Grüter and Benjamin Costerousse both successfully defended their doctoral thesis based on the project.

### PROJECT UPDATE

For fresh fruit, the postharvest loss, from the point of harvest until they reach the consumer, can become as high as 38% of the total produced volume. The project "Eco-smart ventilated packaging for fresh fruit using virtual cold chains" (PACKCHAIN), investigates ventilated packaging as an efficient means to increase product quality and shelf life by better and more uniform cooling throughout the cold chain.

The project team has applied a virtual cold chain method and unveiled, in a unique way, significant differences in cooling strategies and fruit quality among cold chains. Future studies will be directed at the impact of different packaging types on the cooling heterogeneity and quality loss.

To share the findings of the project with experts from academics and industry, the workshop entitled "New cold-chain and packaging technologies to reduce food losses" was held on 27 August 2017, led by Dr. Thijs Defraeye.

Three scientific journal articles featuring the work have been submitted, and the work has been highlighted in the *Coop Magazine*.



#### WORLD FOOD SYSTEM GRANTS: CURRENTLY FUNDED PROJECTS

Project Title	Time Frame	Principal Investigators	Amount (CHF)	Program
Understanding the effects of irrigation modernization in water resources management – citrus production in the Jucar river basin, Spain (IRRIWAM)	2018 - 2020	Prof. H. Yang, Eawag	266'686	Coop Research Program
Black soldier fly larvae reared on various substrates as novel protein source: utility and constraints of its use in the nutrition of organic laying hens and broilers (Hen and Fly)	2018 - 2021	Prof. M. Kreuzer, Animal Nutrition	180'000	Mercator Reseach Program
Biological control of soil-borne insect pests using combinations of plant-beneficial fluorescent pseudomonads with insecticidal activity, entomopathogenic nematodes and entomopathogenic fungi (BeneComb)	2018 - 2021	Dr. M. Maurhofer, Plant Pathology	297'963	Mercator Reseach Program
Increasing genetic gain in climbing bean development (IncreBean)	2018 - 2020	Prof. B. Studer, Molecular Plant Breeding	350'000	Coop Research Program
Application of Lactobacillus reuteri to naturally prevent  Campylobacter colonization of chicken (CampyChick)	2017 - 2019	Prof. C. Lacroix, Food Biotechnology	274'700	Coop Research Program
New sustainable food formulations based on algae proteins (NewAlgae)	2017-2019	Prof. A. Mathys, Sustainable Food Processing	279'935	Coop Research Program
Resilience of organic and conventional production systems to drought (RELOAD)	2017-2020	Prof. N. Buchmann, Grassland Sciences	428'843	Mercator Research Program
Assessing the role of organic value chains in enhancing food system resilience (OrRes)	2017-2021	Prof. J. Six, Sustainable Agroecosystems	284'709	Mercator Research Program
Developing a sustainable value chain of Brazil nuts (Bertholletia excelsa) for Swiss consumers: An interdisciplinary approach (SUSTAIN)	2016 – 2018	Dr. C. Kettle, Ecosystem Management	278'010	Coop Research Program
Soft matter approach to effective preservation of African leafy vegetables (ALVs) by drying by desiccant / solar hybrid system (SoLVeD)	2016 – 2018	Prof. R. Mezzenga, Food and Soft Materials	280'530	Coop Research Program
Assessing and enhancing the resilience of the tef and cocoa value chains (AERTCvc)	2016 – 2018	Prof. A. Patt, Climate Policy	249'840	Coop Research Program
Non-thermal plasma as a sustainable intervention technology to improve shelf life and safety of sprouted seeds (microPLASMA)	2016 – 2018	Dr. M. Schuppler, Food Microbiology	223'592	Coop Research Program
Ecological intensification of organic rooibos cultivation in South Africa (EcoInt)	2016 – 2019	Prof. E. Frossard, Plant Nutrition	283'540	Mercator Research Program
Global organic agriculture: Challenges and opportunities	2016 – 2019	Dr. S. Pfister, Ecological Systems Design	268'994	Mercator Research Program

Project Title	Time Frame	Principal Investigators	Amount (CHF)	Program
Nitrified urine as fertilizer: A trans-disciplinary approach to solutions-oriented community development (NUFSOC)	2016 – 2019	Prof. J. Six, Sustainable Agroecosystems	249'726	Mercator Research Program
Improving disease resistance of pea through selection at the plant-soil interface (ResPEAct)	2016 – 2019	Prof. B. Studer, Molecular Plant Breeding	271'670	Mercator Research Program
How to sustainably intensify organic Basmati rice production in Uttarakhand, India? (BasmaSus)	2015 – 2018	Dr. C. Decock, Sustainable Agroecosystems	292'689	Coop Research Program
Environmentally-smart ventilated packaging for fresh fruit using virtual cold chains (PACKCHAIN)	2015 – 2017	Dr. T. Defraeye, Building Physics	217'654	Coop Research Program
Dairy products as essential sources of iodine in the Swiss population: Under-standing iodine transfer into milk and milk products and its bioavailability in humans (MIOD)	2015 – 2017	Dr. I. Herter-Aeberli, Human Nutrition	264'702	Coop Research Program
Advanced breeding of high energy red clover for sustainable ruminant live-stock production (HERC)	2015 – 2018	Prof. B. Studer, Molecular Plant Breeding	234'000	Coop Research Program
Towards nutritional security through organic management of soil fertility in orange-fleshed sweet potato systems (ORMASP)	2015 – 2019	Prof. J. Six, Sustainable Agroecosystems	234'850	Mercator Research Program
Elements of successful novel dual purpose chicken production systems (INDUCE)	2014 – 2017	Prof. M. Kreuzer, Animal Nutrition	250'000	Coop Research Program
Cadmium availability in soils and its uptake by cocoa in Latin America (Cd0C0A)	2014 – 2017	Prof. R. Schulin, Soil Protection	204'000	Coop Research Program
Improving buckwheat as an agronomically attractive crop for healthy food (ImproBuck)	2014 – 2018	Prof. A. Walter, Crop Science	272'278	Coop Research Program
Extensive grazing on subalpine pastures: Integrating biodiversity and the production of meat with special quality [EG4BM]	2014 – 2018	Prof. A. Lüscher, Forage Production and Grasslands	190'000	Mercator Research Program
A comprehensive examination of nitrogen cycling and microbial communities within soil microenvironments in integrated organic farming systems in Switzerland (NORGS)	2014 – 2018	Prof. J. Six, Sustainable Agroecosystems	245'000	Mercator Research Program
Zinc biofortification of wheat through organic matter management in sustainable agriculture (ZOMM)	2013 – 2017	Prof. R. Schulin, Soil Protection	392'000	Mercator Research Program
Greenhouse gas emissions of dairy production systems based on longevity and zero-concentrate strategy as compared to conventional systems (LLC)	2012 – 2017	Prof. M. Kreuzer, Animal Nutrition	192'000	Mercator Research Program
Managing trade-offs in coffee agroforests (MOCA)	2012 – 2017	Prof. J. Ghazoul, Ecosystem Management	228'000	Mercator Research Program

ETH STUDIO AGROFOOD

#### FLAGSHIP PROJECTS

The Center launched an initiative in 2013 to support Flagship projects, envisioned as large-scale research initiatives around critical food system topics. Such projects should be visionary and potentially high risk; take a food systems or whole of value chain approach; involve at least three principal investigators from different disciplines; and involve key stakeholders from industry, government, and not-for-profit organizations, in non-competitive roles, working across the food system.

The Center currently supports the work of three Flagship projects: Enhancing Resilience in Food Systems, Novel Proteins for Food and Feed, and the ETH Studio AgroFood. Topics for future Flagship projects have been elicited from WFSC members, with development possible in upcoming years. Learn more at <a href="http://www.worldfoodsystem.ethz.ch/research/flagship-projects">http://www.worldfoodsystem.ethz.ch/research/flagship-projects</a>.

#### COLLABORATIVE RESEARCH

The Center engages in practice-oriented research via special projects with partners to support real world agenda setting and decision-making. Examples of such engagement include being an education partner in the R4D project, Biophysical, institutional and economic drivers of sustainable soil use in yam systems for improved food security in West Africa, led by WFSC member Prof. Emmanuel Frossard. The Center also acts as an education and outreach partner in the international consortium project Delivering Food Security on Limited Land, funded by the Belmont Forum and FACCE-JPI initiative, with WFSC member Prof. Nina Buchmann as co-Principal Investigator.

The ETH Studio AgroFood started in 2016 and is a collaboration of the ETH Crop Science Group, ETH Global, and the WFSC. The project strives to foster research and collaboration on the topic of digitalization within the Swiss food system and, at the same time, help promote concrete actions. Further, the project advocates educating ETH students about the disruptive effects of digitalization in the AgroFood sector and empowering them to develop strategic solutions.

After a first step of stakeholder interviews to understand the needs, challenges, and opportunities of digitalization in the AgroFood sector in Switzerland, the workshop "Challenges of Digitalization in the AgroFood Sector" was held in May 2017 at ETH Zurich. Other highlights from 2017 include an ETH Bachelor excursion to visit the startups Ecorobotix and Gamaya in March and project manager Dr. Eduardo Peréz's keynote at the Agridea workshop on digitalization and decision support in November.



RESILIENCE IN FOOD SYSTEMS



The Center's first Flagship project, Enhancing Resilience in Food Systems, was initiated in 2014 and is a collaboration of the ETH Sustainable Agroecosystems Group, Climate Policy Group, and the Transdisciplinarity Lab. WFSC member Prof. Johan Six leads the initiative. The project seeks to directly contribute to food systems resilience by supporting decision-making in practice through stakeholder participation in case studies and academic education. Support for the multiple subprojects comes from a wide range of food system actors, such as the Swiss Federal Office for Agriculture, the UN Food and Agriculture Organization (FAO), multi-national companies and organizations, and academic partners.

Highlights from 2017 included multiple successful stakeholder workshops in Ghana and Ethiopia and the final report "Resilience in the palm oil value chain in Sabah, Malaysia." Further, as part of the work with the Swiss Federal Office for Agriculture (BLW) and FAO, a stakeholder workshop took place in May at ETH Zurich with over 50 food systems practitioners. Further, the BLW project on the Swiss food system has made significant progress, with nearly 100 stakeholders participating in workshops for each value chain (milk, beef, wheat, wine, and potato), setting the groundwork for a survey in early 2018.

NOVEL

The Flagship project Novel Proteins for Food and Feed started in 2016; it is a collaboration of currently nine member groups, including the Sustainable Food Processing, Animal Nutrition, Consumer Behavior, Food Process Engineering, and Ecological System Design groups. WFSC member Prof. Alexander Mathys leads the interdisciplinary project. The project aims to enable the broad exploration of microalgae and insect proteins for more sustainable food and feed. Components of the multifaceted project include defining target properties and functionalities of the envisioned novel proteins, gaining insights from a consumer perceptive, performing analytical and biological testing, and using a system-oriented approach to assess sustainability.

In 2017, six subprojects were underway; for example, the doctoral project of Moritz Gold, a joint project with Christian Zurbrügg at Eawag, aims to determine what residual organic waste is well-suited for feeding black soldier fly larvae. The project's first stakeholder workshop "Animal Feed Production from Biowastes: A roadmap for research on insect based feed" was held in South Africa in September. Prof. Mathys introduced the Flagship project in numerous forums such as an ETH Alumni Focus event, ETH Agri-Food Alumni meeting, and the World Minds meeting in Zurich. Efforts continue to build the initiative.



## **EDUCATION**

# Building capacity of the next generation of decision makers to provide leadership for sustainable food systems.

The Center organizes a range of education activities including intensive summer school courses, extra-curricular courses and excursions, and a mentoring and career development network. All of these activities are built on an interdisciplinary, critical thinking approach that emphasizes a food systems perspective and involves innovative teaching methods. From these activities, we have created and fostered a global, interdisciplinary community of WFSC alumni.

#### SUMMER SCHOOLS

Since 2013, the cornerstone of the WFSC's educational activities is the "World Food System Summer School" program that each time brings together 20-25 students and young professionals from ETH Zurich and universities from around the world for a 16-day intensive course on food systems. 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, role playing, panels, and hands-on practical applications. Instructors include ETH Zurich faculty, international researchers, and practitioners from industry, public, and non-profit sectors. This ensures the courses balance academic content and rigor with an immersion and experiential learning context.

World Food System Summer Schools: 2013-2017	2017	TOTAL
Summer School courses organized	1	6
Students participating	25	138
Countries represented	17	46
Instructors and contributors involved	35	113

#### COURSES AND EXCURSIONS

Field trips and excursions play a critical role in the ETH Zurich curriculum. Over the past few years, the WFSC has built a portfolio of opportunities for ETH students to learn about the food system through extra-curricular courses

and excursions. All offerings address food system challenges in a cross- and transdisciplinary manner. In 2017, the Center collaborated with partners to offer a three-day course for Master's students at the FAO headquarters in Rome and a Bachelor Excursion to visit the startups Ecorobotix and Gamaya in March.

# MENTORING AND CAREER DEVELOPMENT

Through the Center's educational activities, we create and coordinate a growing interdisciplinary and global community of alumni. In 2017, this alumni network boasted over 160 members. The Center supports this network, together with researchers involved in research projects funded through the Center, by organizing alumni events, regular lunch exchanges, networking opportunities, and career advice. A Facebook platform provides resources and notifications about opportunities, such as funding calls and job openings.

FAO COURSE

#### Food Security and Resilient Food Systems at FAO

In April 2017, the WFSC collaborated with the Swiss Federal Office for Agriculture, the Food and Agriculture Organization of the United Nations (FAO), and Bioversity International

to offer a three-day course for ETH Master's students at the FAO headquarters in Rome. This was the seventh time the course was offered, after being initiated in 2010. The group explored the importance of diversity in creating resilient production systems and improving dietary diversity.



SUMMER SCHOOL 2017

#### **Food Systems in Transition**

In summer 2017, 25 students and young professionals from 17 different countries participated in the Center's WFS Summer School "Food Systems in Transition," hosted at the Sustainability Institute in Lynedoch Ecovillage, near Stellenbosch, South Africa. Over the course of two intense weeks (24 June- 08 July), the students followed the food value chain, interacting with key stakeholders and experts at each step of the way. Education Director Michelle Grant and Education Manager Jonna Cohen led the group of 40 contributors that held sessions looking at the food system from various angles. Sessions included nutrition and health, food systems and policy in Southern Africa, retail and distribution, food processing, organic agriculture, farming and indigenous crops, land and governance, entrepreneurship, climate change, and biodiversity and land use.

The use of a combination of didactic tools, including lectures, workshops, panels, facilitated discussions, field trips, case studies, role-plays, creative work, group work, and community work was used to empower the students to create appropriate solutions to local and global challenges. The diversity and participatory manner of the course resonated with the students.

#### Testimonials from students:

- «This was an incredibly well-directed course with very relevant content, set within a rich learning environment. It makes for a very stimulating learning and growing experience.»
- «The course is a great example of how to deliver complex and often interlinked concepts in the world food system in an engaging and participatory manner.»
- «The discussion and exchange of ideas with the other participants helped me to realize that [even if] we cannot solve the complex problems of the world, starting small and being enthusiastic about solutions is key.»
- «The WFSC summer school was one of the most diverse and vibrant group of people that I have ever worked alongside. Good food, good people!»

The course was subsidized through the kind support of the international consortium "Delivering Food Security on Limited Land" and the Mercator Foundation Switzerland.

Find out more about the Center's summer schools at <a href="http://www.worldfoodsystem.ethz.ch/education/summer-schools">http://www.worldfoodsystem.ethz.ch/education/summer-schools</a>.



## OUTREACH

# Engaging with a broader public audience and exploring the breadth of the world food system.

The Center's outreach events and activities bring together complementary expertise of our members and the experience of colleagues and peers from outside ETH Zurich. We collaborate with partners to jointly organize or host events that leverage the networks and expertise of each of the partners. Our events reach interested stakeholders in Switzerland and abroad and make visible locally how our members and the ETH Zurich community more broadly contribute to global challenges.

PUBLIC AND SPECIALIST EVENTS

The Center organizes and hosts a series of scientific events aimed at increasing awareness of the informed public about both the challenges of the world food system and solution approaches to addressing them. Through a public lecture series, we aim to make contemporary food system research accessible to a wider audience. In 2017, we organized a lecture focused on tackling malnutrition with biofortification with World Food Prize winner Dr. Maria Andrade. We also organized our second WFSC Research Symposium that showcased food systems research taking place at ETH Zurich, featuring presentations from concluding research projects supported by our Research Programs.

Other outreach activities in 2017 included organizing the interactive exhibit "Sustainable Nutrition with Bits and Bytes" at the ETH/UZH Scientifica, hosting a public screening of the documentary Food Evolution, and providing an informative display for the PubliFarm special exhibit Playful Sustainable Shopping «Spielend zum nachhaltigen Einkauf» at the OLMA Swiss Fair for Agriculture and Nutrition.

# RESEARCH DISSEMINATION AND STAKEHOLDER PARTICIPATION

Since our establishment, we have developed a set of tools to communicate to wider audiences about food system topics,

including information about and findings from research projects supported by the WFSC. We do this via our website, fact sheets, reports, newsletters, and social media. In addition, the Center and our members engage with stakeholders in various ways. In particular, we establish project advisory boards with multi-sector participation and engage in diverse forums and bodies, in which we represent the Center and bring a food system perspective to the respective tables.

The WFSC makes regular contributions to the ETH Zurich "Zukunftsblog" where one of the recurring themes is the world food system. Our biannual Center newsletter brings news and updates to a network of over 1800 interested subscribers. We also use the Center's website as a venue to communicate news and findings, with cross-posts and additional food system activities appearing on our social media channels: Twitter (@ethzwfsc), Facebook (@ethzwfsc) and LinkedIn group (World Food System Center).



RESEARCH SYMPOSIUM 2017



The annual World Food System Center Research Symposium held in October 2017 highlighted the research that the Center's Research Programs support as well other food system relevant research conducted by our members and their groups at ETH Zurich, Agroscope, Eawag, and FiBL. The nearly 300 attendees and participants heard oral presentations about six concluding research projects as well as our Flagship projects and then networked while viewing 50 posters showcasing food systems research.

The session on Sustainable Food Value Chains featured concluding postdoctoral projects supported by the Coop Research Program: How to sustainably intensify organic Basmati rice production in Uttarakhand, India (BasmaSus), A virtual cold chain method to improve ventilated packaging for fresh fruit (PACKCHAIN), Elements of successful novel dual purpose chicken production systems (INDUCE), and Development of a high energy red clover (HERC). The following session on Organic Production Systems featured concluding doctoral projects supported by the Mercator Research Program: Management practices for improved soil structure in organic farming: A look into the nitrogen cycle (NORGS) and Integrating conservation goals and meat production on marginal lands (EG4BM).

A networking poster session showcased ongoing food system research and Center initiatives and offered participants the chance to interact directly with researchers.

We congratulate the winners of the two poster prizes awarded at the Symposium. Best Overall Poster Prize: The value of species diversity in grasslands (DIVERSGRASS) by Sergei Schaub, Nina Buchmann, Andreas Lüscher, and Robert Finger. Mercator Poster Prize: Boost algae supply chain applying holistic up- and downstream processes by Leandro Buchmann, Chaudhary Abhishek, Lukas Böcker, and Alexander Mathys.

Find out more about the Center's outreach events at http://www.worldfoodsystem.ethz.ch/outreach-and-events.



The Center was honored to have World Food Prize laureate Dr. Maria Andrade present a public keynote address in September 2017. Dr. Andrade highlighted the most successful case of biofortification to date, orange flesh sweet potatoes (OFSP) in Mozambique and Uganda. The OFSP was conventionally bred to enrich the vitamin A content of the crop and counter the devastating impacts of vitamin A deficiency in Sub-Saharan Africa.

Dr. Andrade addressed local and regional strategies for sweet potato dissemination, including reaching out to communities via song and dance. She also spoke to the challenges of breeding drought resistant varieties of the crop, as well as targeting women and children as entry points for dietary change.

#### EDIBLE RESEARCH

The SNF Agora project Edible Research offers workshops for teenagers aged 12 to 15 to open a window to the world of agricultural ecosystems and their tasty products. The overall project goal is to facilitate dialogue on research for sustainable food systems among teenagers, teachers, agricultural science students and scientists.

In 2017, a first workshop with teachers from Zurich occurred in March, where the project was presented and valuable feedback gathered for planning of further activities. In summer, two Pro Juventute "Ferienplausch" summer camp programs hosted young students aged 12 to 15 to learn about crop production systems, value chains, and sustainability indicators in three-day workshops. The team then visited a secondary school in Urdorf in October 2017.

Learn more about the project at http://www.worldfoodsystem.ethz.ch/outreach-and-events/dissemination-and-participation/agora.



#### **ENABLING GRANTS**

Through targeted Enabling Grants, ranging from a several hundred to several thousand Swiss francs, the WFSC supports early-career scientists and students to engage in auxiliary education and research activities. These grants are available to WFSC member groups and our summer school alumni and are supplied through two mechanisms.

The WFS Fund supports education and research at the ETH Zurich in fields relevant to the world food system. The Ambassadors Program, which is a core outreach activity for the Mercator Program since 2014, supports small projects and short-term educational or professional development activities.

WFSC Enabling Grants: 2012 - 2017	2017	TOTAL
Grants distributed	7	47
- WFS Fund Program	4	23
- Ambassadors Program	3	24
Funding (CHF)	26'066	162'548

#### FOOD SYSTEM STORIES

The Center launched a blog in 2016 featuring the voices and perspectives of the WFSC alumni network. This creative space offers them a platform to share short stories and communicate their observations, experiences, and food system interests in an informal way. It also provides a space to showcase outputs and lessons learned from the Center's Mercator Ambassador Program. The blog boasted 16 stories by the end of the 2017.

http://www.foodsystemstories.org

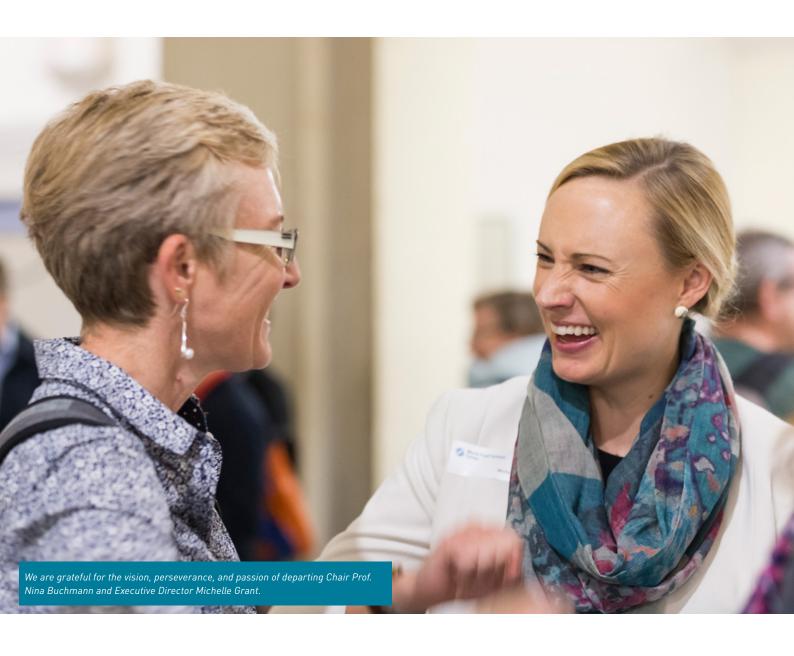
FOOD SYSTEM STORY

#### Creating an alternative food system: My experience in Nepal

A post by Fernando Casillas Bernal took readers deep into the mountains in Nepal, where he chronicles his meeting of small-scale organic farmers.

«Being high up in the beautiful hillsides of Pokhara and seeing the amount of effort and passion small-scale farmers put into their activities (this type of farmers produce over 70% of the world's food needs, according to FAO), I got convinced that all the stakeholders in the food-system need to find alternative approaches to shape the food system under a framework of mutual collaboration, fairness, respect for nature and financial sustainability that allows individuals, families and whole communities to see agricultural activities as a viable way to earn a living.»





## **APPENDIX**

#### **MEMBERS**

- \* indicates Member of Steering Committee
- \*\*indicates Chair of Steering Committee

#### **ARCH**

#### Prof. Alfredo Brillembourg

Architecture and Urban Design

#### Prof. Hubert Klumpner

Architecture and Urban Design

#### **Prof. Gerhard Schmitt**

Information Architecture

#### **BAUG**

#### Prof. Stefanie Hellweg

Ecological Systems Design

#### **BIOL**

#### Prof. Wilhelm Gruissem

Plant Biotechnology

#### \*Prof. Samuel Zeeman

Plant Biochemistry

#### **GESS**

#### Prof. Isabel Günther

**Development Economics** 

#### **HEST**

#### **Prof. Christophe Lacroix**

Food Biotechnology

#### **Prof. Wolfgang Langhans**

Physiology and Behaviour

#### Prof. Martin Loessner

Food Microbiology

#### **Prof. Alexander Mathys**

Sustainable Food Processing

#### \*Prof. Raffaele Mezzenga

Food and Soft Materials

#### \*Prof. Laura Nyström

Food Biochemistry

#### \*\*Prof. Michael Siegrist

Consumer Behavior

#### Prof. Shana Sturla

Laboratory of Toxicology

#### Prof. Erich Windhab

Food Process Engineering

#### Prof. Michael Zimmermann

**Human Nutrition** 

#### **MATV**

#### Prof. Jan Carmeliet

**Building Physics** 

#### **MTEC**

#### \*Prof. Robert Finger

Agricultural Economics and Policy

#### Prof. Stephan Wagner

Logistics Management

#### **USYS**

#### \*Prof. Nina Buchmann

**Grassland Sciences** 

#### Prof. Consuelo De Moraes

Biocommunication and Entomology

#### Prof. Peter Edwards

Singapore-ETH Centre

#### Dr. Adrian Müller

Environmental Policy and Economics

#### \*Prof. Emmanuel Frossard

Plant Nutrition

#### Prof. Jaboury Ghazoul

Ecosystem Management

#### Prof. Michael Kreuzer

**Animal Nutrition** 

#### Prof. Ruben Kretzschmar

Soil Chemistry

#### Dr. Pius Krütli

USYS TdLab – Transdisciplinarity Lab

#### Prof. Andreas Lüscher

Forage Production and Grasslands

#### \*Prof. Bruce McDonald

Plant Pathology

#### **Prof. Anthony Patt**

Climate Policy

#### Prof. Rainer Schulin

Soil Protection

#### Prof. Sonia Seneviratne

Land-Climate Dynamics

#### \*Prof. Johan Six

Sustainable Agroecosystems

#### Prof. Bruno Studer

Molecular Plant Breeding

#### Prof. Susanne Ulbrich

Animal Physiology

#### Prof. Achim Walter

Crop Science

#### Eawag

#### Dr. Christian Stamm

**Environmental Chemistry** 

#### **Prof. Hong Yang**

Water, Environment and Food Security

#### \*Dr. Christian Zurbrügg

Water and Sanitation

## **APPENDIX**

## SCIENTIFIC ADVISORY BOARD

The Center's SAB was formed in 2012 and meets annually. The SAB is comprised of six members who are nominated by the Steering Committee and come from academia, international organizations, think tanks, and the public sector.

Members 2017:

#### Dr. Martin Bloem

Director, Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health

#### Prof. em. Richard Hurrell

Institute of Food, Nutrition and Health, ETH Zurich Board Member of GAIN (Global Alliance for Improved Nutrition)

#### Ian Johnson

Former Secretary General, Club of Rome

#### Prof. Dr. Bernard Lehmann

Director of the Swiss Federal Office for Agriculture

#### Prof. Dr. Michèle Marin

President, Toulouse Research Center, INRA (French National Institute for Agricultural Research) replaced by

#### Prof. Dr. Alban Thomas

Senior Researcher, Toulouse Research Center, INRA

#### Josette Sheeran

President and CEO, Asia Society Former Executive Director of the UN World Food Programme

# PARTNERSHIP COUNCIL

The Center's PC was formed in fall 2011 and meets semi-annually with the WFSC Steering Committee and Executive Office. Members of the PC represent foundations and industry partners who provide significant financial support for projects and programs through the ETH Foundation and who are interested in playing an active role in building joint initiatives.

The PC supports the WFSC by facilitating access to:

- > networks and contacts;
- > real world data and cases;
- industry specific and applied knowledge; and
- > infrastructure, financial, and human resources.

Members 2017:

#### Stiftung Mercator Schweiz

Stephanie Huber

#### **Syngenta Crop Protection AG**

Regina Amman

#### Bühler Group

Dr. Ian Roberts

#### Coop

Annina Böhlen

#### Nestlé

Dr. Frank Lehmann

#### Fenaco

Christian Ochsenbein

#### Migros Industries

Dr. Eliana Zamprogna

# MEMBERS OF EXECUTIVE OFFICE

The Executive Office is responsible for the management and operation of the Center and its research, education, outreach, and communication activities. Together with the Steering Committee, the Executive Office develops and implements the strategy of the Center and builds strategic partnerships and collaborations. It is the central hub for facilitating exchange between members and external partners from academia, industry, government, and the not-for-profit sector.

#### Dr. Martijn Sonnevelt

Executive Director

#### Michelle Grant

**Education Director** 

#### Dr. Anna Katarina Gilgen

Project Manager

#### Dr. Jonna Cohen

**Education Manager** 

#### Dr. Jeanne Tomaszewski

Communications Manager

#### Dr. Eduardo Pérez

Project manager ETH Studio AgroFood

Total full-time equivalents: 4

## **APPENDIX**

#### **FINANCES**

#### **2017 ANNUAL REPORT**

Summary of Consolidated Financials (Infrastructure and Program)

#### Income

TOTAL INCOME	2'360'237
ETH Zurich Infrastructure Funding	250'000
Member Fees	70'000
Management Support Funding from ETH Sources	192'050
Management Support Funding from Third Party Sources	79'000
Donations through ETH Foundation	1'769'187

Expenses	
TOTAL EXPENSES	2'148'044
Programs and Projects	
- Research	1'640'436
- Education	16'359
- Outreach	51'744
Management and Infrastructure	
- Personnel (including social benefits)	419'145
- Office and Administration	8'866
- Travel	3'653
- Communications	758
- Miscellaneous	7'083

#### **SELECTED PUBLICATIONS 2017**

Aganovic, K.; Smetana, S.; Grauwet, T.; Toepfl, S.; Mathys, A.; van Loey, A.; Heinz. V. Pilot scale thermal and alternative pasteurization of tomato and watermelon juice: An energy comparison and life cycle assessment. *J. Clean. Prod.* **2017**, 141, 514-525.

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