## EHzürich

# World Food System Center Annual Report 2018



### 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.









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

In order to make sustainable food choices, we must question the environmental and social impacts of the production and processing of what we put on our plate everyday. As we then learn more about various challenges in our food system, the more we realize how complex the food system is and how difficult it is to make good choices. In order to understand and deal with the environmental and social impacts and trade-offs, we at the World Food System Center believe it is key to take a food systems approach. Only if experts from different fields with varied experiences and viewpoints work together are we able to provide integrated and sustainable solutions to current and future challenges in the food system.

We are proud to look back on a year filled with exciting and informative activities. With the support of our partners, we were able to add four new projects to our list of over 30 doctoral and postdoctoral research projects. Such research is fundamental for a well-informed debate among experts, policy makers, and the public. Co-creation and exchange of knowledge is key to build sustainable food systems, and in 2018, we enjoyed several venues for such exchange: our World Food System Summer School in Côte d'Ivoire (conducted in the framework of the YAMSYS project), our public event on fraud in organic food, the OLMA (the Swiss Fair for Agriculture and Food), and, of course, our Research Symposium.

As we look ahead, we are excited about new initiatives involving the Center. For example, we are proud to manage, together with the Integrative Food Science and Nutrition Center at EPFL, the Future Food Initiative. This new fellowship program was launched by ETH Zurich and EPFL, in cooperation with Swiss industry partners Bühler, Givaudan, and Nestlé. We aim to attract young talents to conduct innovative and industry-relevant research and innovation here in Switzerland. We are also organizing AgriTech Day, together with Strickhof and AgroVet-Strickhof, which is a public field day highlighting the work done at the institutions focused on utilizing modern science and technology to create sustainable solutions for Swiss agriculture. We look forward to welcoming many of you at the event in May.

All of these events show the strength and importance of our network of partners and committed members. We are very grateful for the partnerships with key stakeholders like you and are looking forward to taking on new endeavors together.

Together for a sustainable food system.

A.S. ej. 1

Michael Siegrist Chair

Markjufauth

Martijn Sonnevelt Executive Director

Panel Discussion at Globo Uovo exhibit

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

Student excursion "Sustainable Local Food Systems"



Public event "Smart Farming - What Does It Mean for Switzerland?"



Food Matters Report "Is Climate Change a Risk to Global Grazing Lands?'

Symposium "Addressing the Global Food Challenge with Algae" at AAAS Meeting in USA



Course on Food Security in an Urbanized World at FAO

Public Event "Fraud

Keynote: Prof. Chris

in Organic Food"

Elliott



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



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

JANUARY



WFS Summer School "Food Systems in Transition" in Côte d'Ivoire

Edible Research visits

Berufswahlschule

Limmattal

**FEBRUARY** 



MARCH

The Center's **Research Programs** support three new projects

Survey "Resilience

of the Swiss Food

System" launched

APRIL



MAY

La Rencontre! ArtSci exhibition at D-USYS

JUNE



Keynote at Sustainable Energy

**Education Day** 







Panel Discussion "Der Hype ums Essen" at Zurich **Treffpunkt Science** City

# YEAR IN REVIEW



Edible Research delivers role-playing games to Zurich University of Teacher Education



Keynote at Café Scientifique "Feeding the World in 2050"

Exhibit at the OLMA Swiss Fair for

Agriculture and Food



Excursion for Kantonsschule Stadelhofen at WFSC



JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
	Symposium "Managing Risk in Agriculture"		Course "Innovation in Precision Agriculture"		WFSC Research Symposium
	Animated Video "Grazed and		Public lecture "A Tale of the Black Soldier		Public screening of <i>In Our Hands</i>



Video "Grazed and Confused?"



EEN CONOMY SYMPOSIUM

2018



of the Black Soldier Fly" Keynote: Prof. Jeffery Tomberlin



Alumni strategy workshop



Delivering Food on Limited Land Annual Project Meeting in Brazil

documentary





We believe a broader adoption of a food systems approach would benefit the discourse and design of appropriate solutions to ensure sustainable and resilient food and nutrition security, both now and in the future.

# THE CENTER

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 World Food System Center, we believe a broader adoption of a food systems approach 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. Interventions are 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 together to work collaboratively to design appropriate interventions. Such collaborations that positively support food system outcomes 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 provide 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.



#### ORGANIZATIONAL STRUCTURE

The core of the WFSC is formed by the member group, which in 2018 comprised 42 professors from seven different departments of the ETH Zurich, three different groups of Eawag, and one group of Empa. 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 Exective 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.





The world food system is a complex system, comprised of many interconnected local and regional subsystems. Outcomes of a sustainable food system are food and nutrition security, environmental health and quality, and social well-being. These outcomes, however, are always a result of a complex interplay of various factors and trade-offs. The activities and outputs of a food system depends heavily on well-functioning value chains and a healthy environment. These, in turn, are influenced by interactions and feedbacks with socio-economic and global environmental change drivers. In other words, no silver bullet solution to ensure a sustainable food system exists. Key elements are the efficient use of resources and value chains characterized by closed loops of nutrients and other products when possible, or at least minimized waste and losses.



#### NEW MEMBER PROFILE

Prof. Lenny Winkel leads the group of Inorganic Environmental Geochemistry in the Department of Environmental Systems Science. The group studies biogeochemical cycles of trace elements with important health effects. The spatial distribution, chemical speciation, and bioavailability of essential and toxic trace elements are governed by an array of environmental processes. The group aims to provide fundamental understanding of these processes and predict distributions and bioavailability of trace elements in agricultural and aquatic ecosystems. Such understanding is essential to prevent future health hazards, today and in the future.

«To understand and predict the environmental pathways of essential and non-essential trace elements, their uptake by food crops, and dietary levels, we need to link different disciplines such as biogeochemistry, agricultural, and nutritional sciences. The WFSC is the perfect organization to establish these links.»

Prof. Lenny Winkel

#### NEW MEMBER PROFILE

Prof. Christian Schöb heads the group of Agricultural Ecology in the Department of Environmental Systems Science. The group's work takes a community ecological perspective on crop systems and studies the potential of biodiversity in agriculture, in particular through intercropping. Emphasis is placed on the investigation of plant-plant interactions and their evolutionary and environmental context dependence, using observational and experimental approaches The group aims to transfer ecological knowledge to agricultural ecosystems in order to achieve more sustainable, yet productive agriculture.

«Food is a very complex topic, and the WFSC reflects this complexity through the wide range of expertise represented there. This provides excellent opportunities to put our research on the ecology of agroecosystems into context and to establish inter- and transdisciplinary research, education, and outreach projects.»

Prof. Christian Schöb

### PARTNERSHIP APPROACH

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

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 the 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.

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We enable 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.

## RESEARCH

The global population is expected to reach nearly 10 billion people by 2050. How will we provide adequate nutrition for 10 billion within the bounds of our planet? The United Nations 2030 Agenda for Sustainable Development commits the international community to act together to meet such challenges and transform our world for present and future generations.

We at the World Food System Center aim to generate new scientific knowledge with political, societal, and industrial relevance in a manner that supports real world impact. We strive to provide leadership and foresight on issues connected to food and nutrition security based on innovative solutions for pressing problems of the world food system. We do so through our core research activities including managing competitive research programs, developing and supporting Flagship research projects, and engaging in special research collaborations.

### THEMATIC RESEARCH FOCUS AREAS

The WFSC 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 many 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 systems 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 crossdisciplinary and solution-oriented research to address food system challenges, with 33 projects totaling nearly 9 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 http://www.worldfoodsystem. ethz.ch/research.

Grants Awarded	2011-2017	2018	Total
Projects supported	30		33
Funding dispursed (kCHF)	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 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, 19 postdoctoral research projects have been supported.



#### **PROJECT UPDATE**

Soil-borne diseases severely impede grain legume cultivation worldwide, limiting protein production. The project "Improving disease resistance of pea through selection at the plant-soil interface" **(ResPEAct)** aims to improve the resistance of pea varieties against soil-borne diseases to allow higher frequencies of grain legumes in organic and sustainable production systems.

The project team is striving to identify pea lines resistant to soil-borne pathogen complexes by screening over 300 pea lines for resistance to soil pathogens and then determining the genomic regions responsible for such resistance. Project outputs will provide the knowledge base needed to breed for superior cultivars. In 2018, doctoral student Lukas Wille won the Mercator Poster Prize at the WFSC Research Symposium for his poster based on the project and published a scientific review article highlighting certain strategies and tools breeders can consider to integrate microbiome functions in breeding programs.

#### PROJECT UPDATE

Algae is a promising emerging protein source, as it contains up to 70 percent protein by dry mass, essential amino acids, and high amounts of micronutrients such as iron. The project "New sustainable food formulations based on algae proteins" (NewAlgae) enables interdisciplinary development of innovative upand downstream algae processing based on promising processing elements, such as pulsed electric field technology for growth simulation and extraction. The project team evaluated and adapted several technologies for proper algal protein processing, such as disintegration, extraction, purification, and preservation techniques. They found that certain biomass characteristics and processing parameters, such as moisture content and temperature, can affect the final product.

Five scientific articles featuring the work have been published, and the work has been highlighted in multiple media outlets including the *Neue Zürcher Zeitung*, *Tages Anzeiger*, and *Migros Magazine* as well as the 3sat *Nano* and SRF *Eco* programs.



#### 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 http://www.worldfoodsystem.ethz. ch/research/flagship-projects.

#### 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. In 2018, outreach outputs included the interactive Food Matters report entitled "Is Climate Change a Risk to Global Grazing Lands?" as well as a new animated video "Grazed and Confused? How much can grazing livestock help to mitigate climate change?"



Students presenting their final projects at the course Innovation in Precision Agriculture.

#### FLAGSHIP PROJECT UPDATE

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 advise, coordinate, and support multidisciplinary research projects around the topic of digitalization in the Swiss food system. Further, the project advocates educating ETH students about the disruptive effects of digitalization in the agrofood sector and empowering them to develop strategic solutions.

A major achievement of the project in 2018 was the development and running of the new ETH Zurich course "Innovation in Precision Agriculture" in collaboration with the Chair of Entrepreneurship and the Student Project House. Project manager Eduardo Pérez led the 10-week course in fall 2018, during which students heard from guest lecturers from the Swiss agrofood sector and developed and prototyped their solutions to a challenge of their choice. Collaborators also offered various opportunities to further develop the project ideas into start-up initiatives.

Also, Principal Investigator Prof. Achim Walter alongside former Swiss Federal Councilor Johann Schneider-Ammann and former ETH Zurich president Lino Guzzella shared their views on "Smart Farming - What does it mean for Switzerland?" at a public event in June 2018. The event was organized by the ETH Studio AgroFood, ETH Global, and the Center.



Workshop with Ghanaian cocoa farmers about measures to enhance resilience to drought.

#### FLAGSHIP PROJECT UPDATE

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 the 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 (FOAG), the UN Food and Agriculture Organization (FAO), multi-national companies and organizations, and academic partners.

Highlights from 2018 included successful stakeholder workshops in Ghana and Ethiopia as well as final reports of the project "Assessing and enhancing the resilience of the tef and cocoa value chains" **(AERTCvc)**. Also, in spring 2018 a survey of Swiss stakeholders was completed in order to analyze the resilience of the milk, beef, wine, wheat, and potato value chains. Further, as part of the collaboration with the FAO and FOAG, Dominique Barjolle led a workshop on the tools and innovations needed to build resilience of farmers and territories at the "Forum Origin, Diversity and Territories," held in September in Torino, Italy. Other projects continue worldwide, including work in Morocco, Ghana, and the Dominican Republic.

#### FLAGSHIP PROJECT UPDATE

The Flagship project **Novel Proteins for Food and Feed** started in 2016. The project aims to enable the broad exploration of microalgae and insect proteins for more sustainable food and feed. WFSC member Prof. Alexander Mathys leads the interdisciplinary project. Components of the multifaceted project include defining target properties and functionalities of the envisioned novel proteins, gaining insights from a consumer perspective, and using a system-oriented approach to assess sustainability.

In 2018, several subprojects were underway, including the projects "Insect production from biowastes for animal feed" and "New sustainable food formulations based on algae proteins" (NewAlgae). This research was highlighted throughout 2018 in numerous media outlets such as the SRF business magazine *Eco*, the 3sat *Nano* science program, the *Neue Zürcher Zeitung*, *ETH News*, and *Migros Magazine*.

In addition, the symposium "Addressing the Global Food Challenge with Algae," organized by Prof. Mathys and collaborators from Wageningen University and EnerGaia successfully took place at the American Association for the Advancement of Science AAAS 2018 Annual Meeting in February. Prof. Mathys also introduced the Flagship project in numerous forums such as the World Congress of Food Science and Technology in India, the Royal Swedish Academy of Science in Sweden, and the ETH-Industry Dialogue on the Future event.



Researchers at work in tle Sustainable Food Processing laboratory.



We build capacity in the next generation of decision makers to provide leadership for sustainable food systems issues.

## EDUCATION

The Center organizes a range of the education activities including intensive summer school courses and extra-curricular courses and excursions. 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 Center's educational activities is the World Food System (WFS) Summer School program that 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. This course incorporates a variety of innovative teaching methods, 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. Find out more about the Center's summer schools at http://www.worldfoodsystem. ethz.ch/education/summer-schools.

World Food System Summer Schools: 2013-2018	2018	TOTAL
Summer School courses organized	1	7
Students participating	26	164
Countries represented	14	49
Instructors and contributors involved	18	135

Summer School Evaluation. In 2018, the Center assessed the mid-term impact of the WFS Summer Schools using both an online survey and focus groups. One of the main objectives of the WFS Summer School Evaluation was to identify potential mid-term outcomes of the courses on the professional, academic, and private lives of the alumni.

The online survey was sent to participants from the 2013 to 2016 summer schools. Overall results showed that participants felt the course broadened their horizon and inspired them. They learned about working with people from different disciplines and cultures, food system challenges, systems perspectives, and organic production systems. Generally, the results suggest that the courses were influential in participants' career decisions, academic career, and private lives. Furthermore, participants left highly motivated to learn more about, and change, the food system. After the course, participants contribute to change in the food system in a number of different ways, most notably by conducting research, through changing their own consumption behavior, and by educating others. Hence, the courses have an effect in motivating life-long learning and engagement in creating change.

**Criteria for optimal course design.** A **publication** in *GAIA* - *Ecological Perspectives for Science and Society* by a team of authors from the Center, including Michelle Grant, Nina Buchmann, and Aimee Shreck, discussed the conceptual framework for the summer school program. The article elucidated the design criteria used to design and deliver the program, ranging from using a systems thinking approach to appreciating participants as both producers and users of knowledge, and shared some challenges faced and lessons learned.

Research meets education. The WFSC plays a role in connecting the latest research at ETH Zurich to education opportunities, as highlighted in the collaboration the WFSC facilitated between the Swiss National Science Foundation projects "Oil palm adaptive landscapes" (OPAL) and "Biophysical and socio-economic drivers of sustainable soil use in yam systems for improved food security in West Africa" (YAMSYS). The objective was to create a role-play game that supports stakeholders in yam value chains to explore challenges and strategies and, ultimately, to support decision-making for more sustainable yam cultivation. The OPAL team trained students on creating the game through an ETH Zurich curricula course, including inputs from researchers from the YAMSYS project. This game was then used in the WFS summer school in Côte d'Ivoire in 2018 before being further developed and refined by masters students working with farmers and other stakeholders in the field in Côte d'Ivoire and Burkina Faso. The final version will be presented to policy makers at the Yam Forum in Abidjan in 2019. It will also be adapted into game boxes disseminated in the field and used to support education and dialogue among stakeholders.



#### SUMMER SCHOOL 2018

The WFS Summer School 2018 took place in Côte d'Ivoire, in collaboration with the Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS). In order to understand the world food system and find ways to deal with its complexity, 26 graduate students and young professionals from around the world took part in the two-week (27 January - 10 February) intensive course, which considered food systems in rapid transition.

The course program included a mixture of theoretical inputs, participant led discussions, peer to peer learning, field trips, case study work, design thinking approaches, and simulation games. A diverse range of faculty contributed inputs from different disciplines and sectors to add to the rich learning experience. The students were able to discuss the challenges facing smallholder yam farmers in the region with local villagers and learn about the increasing challenges with soil fertility and declining yields, against a backdrop of climate change. Several days were also spent learning about the cacao value chain and understanding the challenges and opportunities facing this cash crop and those involved in its production. Exploring these two value chains allowed insight into not only the challenges facing food production in the country, but also food consumption and how that links to nutrition and health.

#### Testimonials from students:

«This course was transformational learning for thought leaders that not only offers self-examination but also solutions and innovation development.»

«Participating is this summer school was an eye opener. It gave me insights about the complexity inherent in the global food system and how a systems approach is crucial in making it work for the benefit of all actors.»

Voices from the WFS Summer School. A series of interviews with contributors and daily posts provided an intimate look into this rich learning experience. The #wfsceducation campaign ended with 40 posts, reaching nearly 20,000 and garnering 370 likes.

This course was subsidized through the kind support of the Swiss National Science Foundation Research for Development Project "Biophysical and socio-economic drivers of sustainable soil use in yam cropping systems for improved food security in West Africa" (YAMSYS) and the Mercator Foundation Switzerland.







with a yam vendor at a market in Yamoussoukro.

#### COURSES AND EXCURSIONS

Field trips and excursions play a critical role in the ETH Zurich curriculum. Since its start, 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.

Since 2010, the WFSC has collaborated with the Food and Agriculture Organization of the United Nations (FAO) and the Sustainable Agroecosystems Group to offer a threeday course for ETH Zurich Master's students at the FAO headquarters in Rome. In partnership with Bachsermärt, the Center also offered the excursion "Sustainable local food systems" in April 2018, where ETH students explored regional food networks in Zurich.

#### ALUMNI COMMUNITY

Through the Center's educational activities, we create and coordinate a growing interdisciplinary and global community of alumni. In 2018, this alumni network boasted 189 alumni from over 50 countries. 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

Every spring, 20 ETH Zurich students travel to the headquarters of the Food and Agriculture Organization of the United Nations (FAO) in Rome for an immersive learning experience. The course in April 2018 focused on food security in an urbanized world, with students working in groups to develop innovative strategies for urban food system networks. It also coincided with the Second International Symposium on Agroecology, which allowed the students the experience of joining an international symposium held at the FAO as part of the Swiss delegation.



ETH Zurich students at the FAO in Rome.

### ALUMNI STRATEGY DEVELOPMENT

The current alumni network offers a wonderful opportunity for future impact. As they move into their professional lives, the value of this network will only amplify, and we feel it is important to support the group to leverage their potential.

In 2018 several events helped to shape this community. The summer school evaluation highlighted the needs and interests of the alumni. Also, a three-day alumni workshop took place in Berlin in June. The focus groups and other sessions resulted in the creation of a working group to develop three interrelated activity areas: establishing an organizational structure, creating opportunities for ongoing learning and contribution, and building an online platform for alumni engagement. Lastly, a strategy workshop was held in Zurich in November. The working group drafted a mission, vision, and values statement, as well as shared progress in the three focus areas with the larger alumni community.

The working group is collaborating with the Center and the broader alumni network to finalize the strategy around the three areas and to launch a pilot phase of a more formalized alumni association in 2019. Rhea Cordeiro leads the set-up of an online platform for alumni engagement, Pienaar du Plessis is working to establish the organizational structure, and Annet Westhoek facilitates ongoing learning and collaboration opportunities.



Focus areas of the alumni strategy



Symposium with Education Manager Jonna Cohen

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We engage with a broad audience to increase awareness about both the challenges of the world food system and solution approaches to addressing them.

# OUTREACH

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 event series, we aim to make contemporary food system research accessible to a wider audience. In 2018, we organized a lecture focused on fraud in organic food with Professor Chris Elliott from Queens University Belfast. We also organized our third 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 2018 included the co-creation of ETH Zurich's exhibit at the special show "Experience Food" at the OLMA Swiss Fair for Agriculture and Nutrition, which attracted over 16,000 visitors during ten days in October. We also collaborated with many other ETH Zurich units to put on several interesting events including "Smart Farming - What does it mean for Switzerland?," together with ETH Global; the symposium "Managing Risk in Agriculture," together with ETH Risk Center and the Agricultural Economic and Policy group of Prof. Robert Finger; the lecture "A Tale of the Black Soldier Fly," with the Institute of Food, Nutrition, and Health and Prof. Alexander Mathys; and a public screening of the documentary *In Our Hands*, with the ETH Center for Development and Cooperation.

## RESEARCH DISSEMINATION AND STAKEHOLDER PARTICIPATION

Since our establishment, we have developed a set of tools to communicate with broad audiences about food system topics, including information about and findings from research projects supported by the Center. 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 1600 interested subscribers. We also use the Center's website as a venue to communicate news and findings, with 73 news items published in 2018. The WFSC also has a growing social media presence:





World Food System Center

World Food System Center ETH Zurich

**Edible Research.** The SNF Agora project Edible Research aims to facilitate dialogue on research for sustainable food systems between teenagers, teachers, agricultural science students and scientists. The collaboration between the Sustainable Agroecosystems group of Prof. Johan Six and the Center offers workshops for teenagers aged 12 to 15 to open a window to the world of agricultural ecosystems and their tasty products. In 2018, the team visited the vocational school Limmattal in Schlieren and created two different role-playing games for use as teaching materials on sustainable food systems. Anett Hofmann delivered the boxed games to the Zurich University of Teacher Education (PHZ) in August.



#### **RESEARCH SYMPOSIUM 2018**

The annual World Food System Center Research Symposium held in November 2018 highlighted the research that the Center's Research Programs support as well other food system relevant research conducted by our member groups. The event featured oral presentations from four concluding research projects as well as insights from our education initiatives.

The audience of over 300 contributors and guests heard from the projects "lodine in milk and dairy products in relation to iodine in feed and the contribution to iodine intake in Swiss adults" (MIOD), presenter Olivia van der Reijden; "Inactivation of microorganisms on seeds for sprout production using cold atmospheric pressure plasma" (microPLASMA), presenter Markus Schuppler; "Soft matter approach to effective preservation of African leafy vegetables by drying" (SoLVED), presenter Leonie van 't Hag; "Assessing the resilience of tef and cocoa farmers against drought in Ethiopia and Ghana" (AERTCvc), presenter Jonas Joerin. All presentations can be viewed online.

Our own Michelle Grant and Jonna Cohen then introduced how our summer schools build the capacity of the next generation of food system leaders. Attendees then networked while viewing 50 posters highlighting food systems research of our members and other groups at ETH Zurich, Agroscope, Eawag, Empa, FiBL, and University of Zurich.

We congratulate the winners of the two poster prizes awarded at the symposium: Best Overall Poster Prize: "Determinants of collective climate change mitigation in agriculture" by Cordelia Kreft, Robert Huber, and Robert Finger, and the Mercator Poster Prize: "Improving disease resistance of pea - clues from plant-microbe interaction" by Lukas Wille, Pierre Hohmann, Monika M. Messmer, and Bruno Studer.

We thank all presenters and contributors for making this networking event such a success.

To find out more about the symposium, check out our website and watch our video of participants' impressions at the poster session: www.worldfoodsystem.ethz.ch/ outreach-and-events/past-events/symposium-2018





#### PUBLIC LECTURE

At the Center's public event "Fraud in Organic Food," keynote speaker Professor Chris Elliott from Queens University Belfast led a discussion on fraud in organic food and how science can play a role in its detection and prevention. Prof. Elliott addressed the audience of 100 guests on 26 April in the Semper Aula at ETH Zurich.

Prof. Elliott introduced instances of food fraud from around the world, focusing on false claims in organic. He mentioned that he has seen fraud is on the rise, and he desires to help before customer confidence in organic labeling is eroded. Prof. Elliott also focused on the topic of detection, mentioning fraud in organic is difficult to detect, so numerous tools such as audits, inspections, and digital supply chains are used. He introduced various new analytical techniques used to identify fraudulent products, such as pesticide-residue or metabolites analysis.

Hans Ramselier from BioSuisse and Patrik Aebi from the Swiss Federal Office for Agriculture then joined the discussion, providing a Swiss perspective on fraud in organic food. We thank all for making this public event such an interesting discussion. Interviews with Prof. Elliot with the Center's Martijn Sonnevelt and Michelle Grant on what food fraud means for our food system today can be seen on our **YouTube channel**.

#### OLMA

On sunny days in St. Gallen, Switzerland, visitors gathered for ten days (11-21 October) at OLMA, the Swiss Fair for Agriculture and Food. A special show, open to the general public, allowed all to "Experience Food (Erlebnis Nahrung)" and learn about the wonders of grains, from the field to the plate.

The exhibit showcased how ETH Zurich strives to play a leading role in providing new ideas to food system challenges across the globe. Researchers from many departments came together to show visitors how we can combat food waste and increase biodiversity, as well as to share stories about tef, a nutritious, traditional food from Ethiopia. The Plant Science Center coordinated the exhibit, led by Juanita Schläpfer-Miller. The World Food System Center contributed exhibit design and content focusing on the issue of how we feed nine billion people in 2050 while ensuring human health, environmental sustainability, and social well-being for us all.

Over the ten days, a minimum of 16,000 visitors came to the ETH Zurich exhibit, and learned by counting leaf openings using a microscope, experiencing a VR flight, checking the greenhouse for black soldier flies, or picking up a telephone to listen to stories about tef. A special thanks to all the researchers involved in creating the multifaceted exhibit, as well as all the student assistants who engaged with our visitors.



#### 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 alumni of the World Food System Summer School program 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 - 2018	2018	TOTAL
Grants distributed	9	56
- WFS Fund Program	5	28
- Ambassadors Program	4	28
Funding (CHF)	35'905	198'460

### 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 21 stories by the end of the 2018.

http://www.foodsystemstories.org/

#### REPRESENTATION AT CNS-FAO

Michelle Grant represents ETH Zurich in the Swiss National Committee of the UN FAO (CNS-FAO), a position nominated by the federal council. At the end of 2018, the committee prepared a multi-stakeholder discussion paper that serves to orient the Swiss government and interested stakeholders on agroecology as a means to achieve the Sustainable Development Goals (SDGs). The paper is unique in the sense that a multi-stakeholder group, including representatives from NGOs, crop protection industry, academia, and farmers associations, collaborated in its preparation. The final version was approved by the CNS-FAO committee in 2019.



Food System Story highlight: Luna Urio building an environmentally friendly burger.







Ambassadors Program highlight: Benjamin Gräub and Daniel Owino working together testing FarmBetter with smallholder farmers in Kenya.

## APPENDIX

#### **MEMBERS**

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

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# 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 2018:

#### 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. 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 2018:

#### **Stiftung Mercator Schweiz**

Bühler Group

Соор

Fenaco

**Migros Industries** 

Nestlé

Syngenta Crop Protection AG

### 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

#### **2018 ANNUAL REPORT**

Summary of Consolidated Financials (Infrastructure and Program)

Income	
TOTAL INCOME	
ETH Zurich Infrastructure Funding	250'000
Member Fees	62'000
Management Support Funding from ETH Sources	150'000
Management Support Funding from Third Party Sources	90'000
Donations through ETH Foundation	894'649
Miscellaneous	7'082

Expenses	
TOTAL EXPENSES	
Programs and Projects	
- Research	844'649
- Education	5'722
- Outreach	12'718
Management and Infrastructure	
- Personnel (including social benefits)	469'825
- Office and Administration	14'079
- Travel	4′138
- Communications	554
- Miscellaneous	4'303

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### WORLD FOOD SYSTEM GRANTS: CURRENTLY FUNDED PROJECTS

Project Title	Time Frame	Principal Investigator	Amount (CHF)	Program
Sustainable intensification through agroecosystem diversification: optimizing organic bean production in Macedonia (DiverBeans)	2019 – 2021	Prof. C. Schöb, Agricultural Ecology	299'673	Coop Research Program
Dynamic agroforestry systems for sustainable intensification of cocoa production in West Africa (DAFS)	2019 – 2021	Prof. J. Six, Sustainable Agroecosystems	270'000	Coop Research Program
Measurement and optimization of iron bioavailability in sustainably produced insect based foods: estimation of the nutritional potential as alternative dietary iron sources in human subjects (Sust-iron-able)	2019 – 2021	Prof. Michael B. Zimmer- mann, Human Nutrition	235'495	Coop Research Program
Does maternal algae intake affect the metabolic health of the offspring? Search for potential transgenerational effects of a superfood	2018 – 2021	Dr. Kathrin Giller, Animal Nutrition	287'000	Other funds
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	Prof. 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, Grass- land 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 ( <i>Bertholletia excelsa)</i> 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

Project Title	Time Frame	Principal Investigator	Amount (CHF)	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 (GOA)	2016 – 2019	Dr. S. Pfister, Ecological Systems Design	268'994	Mercator Research 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
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
Cadmium availability in soils and its uptake by cocoa in Latin America (Cd0COA)	2014 – 2018	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 Switzer <u>land (NORGS)</u>	2014 – 2018	Prof. J. Six, Sustainable Agroecosystems	245'000	Mercator Research Program

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ETH Zurich, April 2019

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