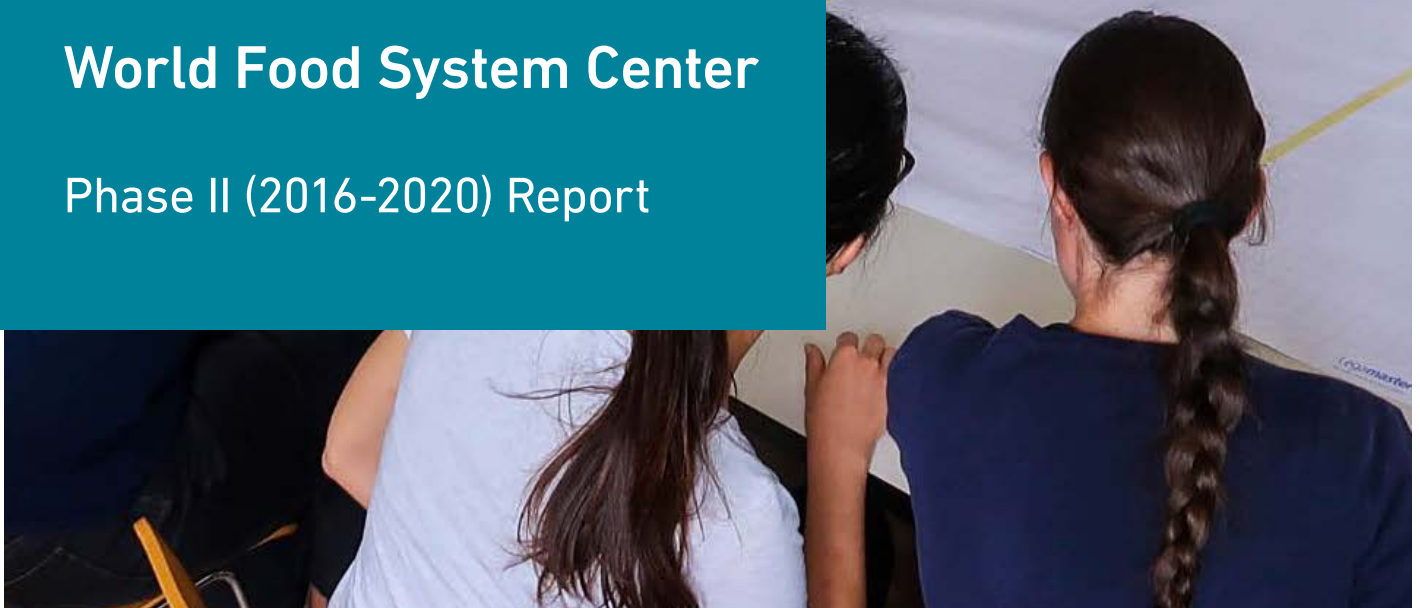




World Food System Center

Phase II (2016-2020) Report





Dear Colleagues, Partners, Alumni, and Friends:

Since 2011, we at the World Food System Center have aimed to provide real-world solutions to the challenge of feeding the world in a way that ensures human health, environmental sustainability, and social well-being. Throughout the initial phase of operations (2011-2015) as well as the now concluded second phase (2016-2020), the Center established itself as an important platform for vital exchange and a supporter of solution-oriented research and innovations.

Encouraging Collaboration

This report provides a brief overview of the activities of the World Food System Center during the last five years. This period was marked by growth, and the Center now brings together 46 member groups, containing around 1000 scientists contributing to making global food systems more sustainable. We look back with joy and satisfaction on how we managed to integrate research, education, and outreach throughout Phase II of the Center.

Our members conduct cutting-edge research that contributes to more sustainable and resilient food systems, and feedback shows the dialogues created while doing so positively affects the perspective of the scientists and translation of their work into practice. With our research programs, often developed in close collaboration with our partners, we facilitate the establishment and application of inter- and transdisciplinary concepts to encourage co-creation across disciplines and stakeholder groups. Our rich portfolio of educational activities motivates and supports young professionals, researchers, and students in Switzerland but also all over the globe to learn new tools and discover new paths for their professional development. Finally, we translate research results and make them applicable for industry and society.

Looking Forward

In 2020, the Center was evaluated, and with a positive appraisal, the ETH Zurich School Board confirmed a continuation of the Center into a third phase from 2021-2024. Looking towards the future, we plan to build on the impressive breath of expertise among our 46 members to address current and future challenges. Through dialogue and foresight, as well as an

intensified involvement of key partners from different sectors and disciplines, we aim to jointly identify needs and priorities and co-develop inter- and transdisciplinary research projects building on our core expertise.

The research of our members serves as a constant foundation and primary motivation to enrich the broad curricula at ETH Zurich with additional education offerings that enable and inspire students and young professionals to initiate change in the food system. Outreach and dialogue are key activities to highlight the expertise of ETH Zurich in food system research. This is why we aim to enlarge communication and outreach activities to be able to bring food-related innovations and evidence-based and applicable knowledge to society. We want to develop, in collaboration with various actors across the food system, formats to discuss promising solutions to pressing global food challenges.

It has been a great privilege and joy for us to work closely together with our members and partners over the last years. As we move into the next phase until 2024, we count on their continuous support and look forward to collaborating across disciplines and sectors to address the ever pressing global challenge of ensuring food and nutrition security and pursue our long-term vision of a healthy world through sustainable food systems.



Robert Finger
Chair
Professor of Agricultural Economics and Policy at ETH Zurich



Martijn Sonneveld
Executive Director

Robert Finger
Chair

Martijn Sonneveld
Executive Director

PHASE II IN REVIEW



March 2016
WFSC Research Programs fund 8 new projects



March 2016
Public Lecture: Sustainable Proteins of the Future



April 2016
Sustainable Campus Catering Workshop



April 2017
Food Security Course at FAO in Rome




May 2017
Stakeholder Workshop: Innovations for Building Resilience in Food Systems



May 2017
Stakeholder Workshop: Challenges of Digitalization in the AgroFood Sector

Highlights

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



January 2018
Summer School on Food Systems in Transition in Côte d'Ivoire




March 2018
WFSC Research Program fund 3 new projects



April 2018
Public Lecture: Fraud in Organic Food



February 2019
Future Food Initiative launched and 4 fellows selected



April 2019
Public Event: Pesticides – What Does Science Say?



May 2019
AgriTech Day: Agriculture of the Future – Digital and Sustainable?



August 2020
Alpine Excursion: Exploring Sustainable Regional Food Networks in the Swiss Mountains




October 2020
Public Webinar: Pathways for Advancing Pesticide Policies



October 2020
Production of 7 films from WFSC Research Programs projects

2016



May 2016
ETH Meets California Study Tour: Tackling Food System Challenges with IT Innovation



July 2016
Sight and Life Issue on food systems



August 2016
Summer School on Organic Agriculture and Food Systems in Switzerland

2017



September 2017
Sustainable Nutrition with Bits and Bytes exhibit at Scientifica



September 2017
Public Lecture: Tackling Malnutrition with Biofortification



October 2017
WFSC Research Symposium with 9 presentations and 50 posters

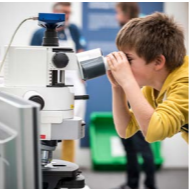
2018



June 2018
Stakeholder Workshop: Resilience of the Cocoa Value Chain in Ghana



June 2018
Alumni Workshop in Berlin




October 2018
ETH Zurich Exhibit at OLMA

2019



June 2019
Learning Exchange with Assam Agricultural University

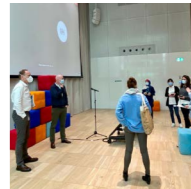


August 2019
Selected as Beacon of Hope for Accelerating Transformations to Sustainable Food Systems



October 2019
WFSC Research Symposium with 5 presentations and 50 posters

2020



October 2020
Visits with Future Food Initiative industry partners Bühler, Givaudan, and Nestlé



November 2020
Cook Along Event: Changing the Food System, One Meal at a Time



December 2020
Public Webinar: Plant Breeding for Global Food Security

We support innovations from the laboratory as well as through dialogue to create lasting positive change.



THE CENTER

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

Food Systems and the Sustainable Development Goals

In the coming decades, the world food system will face unprecedented challenges in its ability to feed and nourish the world. Fighting hunger was therefore included as a central element in the United Nations (UN) Sustainable Development Goals (SDGs) and part of the 2030 Agenda for Sustainable Development to build a better world. The 2030 Agenda calls upon all states, including Switzerland, to implement the SDGs by working together with business, NGOs, governments, academia, the UN, and other actors. However, since the SDGs came into effect in January 2016, the world has actually witnessed an increase in the number of persons suffering from hunger.

The way the world produces, consumes, and wastes food is far from sustainable. Producing, processing, and delivering food is resource- and energy-intensive, with the agricultural sector, together with forestry, actually accounting for 24% of yearly total greenhouse gas emissions. In addition, the UN estimates that each year, a third of the food produced worldwide worth US \$1 trillion ends up rotting in waste bins or spoils because of poor transportation or harvesting practices. Clearly, if the world fails to increase efforts and to implement more targeted measures, the ambitious SDGs will not be achieved.

Looking forward, the UN Food Systems Summit planned in October 2021 will have a major impact on the international debate on sustainable food systems. The Summit has the potential to stimulate needed and constructive discussions on ideas and solutions that inspire and accelerate food system transformation all over the world.

The Center

In order to play a leading role in addressing the challenges of how to feed the world in a way that ensures human health, environmental sustainability, and social well-being, ETH Zurich established the World Food System Center (WFSC). The Center acts as a coordination and management platform to establish research, education, and outreach initiatives that bring its members together to collaborate in interdisciplinary ways and with a variety of external partners.

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

Our Vision: A healthy world through sustainable food systems.



Systems Approach

The WFSC bases its work on the belief that a broader adoption of a food systems approach allows building resilient food systems capable of providing food and nutrition security over the long term. Discourse on the global challenge of food security has historically mostly focused on how to grow enough food. This focus, however, overlooks the fact that achieving food and nutrition security requires more than just producing enough calories for all. Access for each individual to a quality and safe diet with adequate macro- and micronutrients must also be ensured. Overweight and obesity are widespread while macro- and micronutrient deficiencies affect billions, creating a triple burden of malnutrition in many 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.

Therefore, a food systems approach is only 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.

Values

Seven core values dictate the organizational conduct of the Center. These 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.

Elements of the World Food System (developed for OLMA 2018). 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.



Organization Structure

The core of the WFSC is formed by the member group, which in 2020 comprised 46 professors from seven different departments of ETH Zurich, three different groups of Eawag, and one group of Empa. The Steering Committee, formed by a group of maximal ten elected members and led by a Chair, oversees the strategy and operational functions carried out by the Executive Office.

The multi-disciplinary pool of expertise of member groups is a distinct competence of the Center, and allows for solution innovation across the food system and addressing challenges across disciplines and scales. This astounding competence spans the food system, from environmental science, agricultural science, food science, nutrition, and immunology, and includes topics such as technology innovation, economics, and policy as well. This body of work continues in parallel with and is supported by the WFSC.

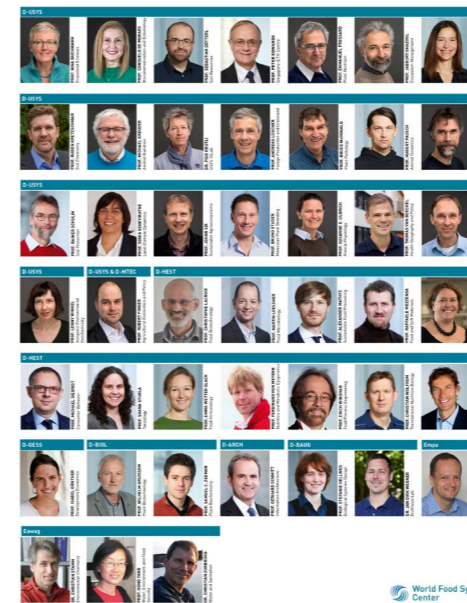
During Phase II, a Scientific Advisory Board of six external advisors provided strategic advice to the Steering Committee and connections to key external organizations. Also, a Partnership Council was formed by foundations and industry partners who make substantial donations to the programs of the Center through the ETH Zurich Foundation. Moving forward, the Center plans to create one expert committee to identify key challenges of the food system, outline priorities, and sketch pathways to address future issues.

Partnership Approach

The WFSC strives to work together with others in partnerships to achieve together what no partner could achieve on its own. Both strategic and collaborative partnerships are developed, and the WFSC indirectly fosters new partnerships at the project level. This partnership approach has been critical to the Center's success. This approach is also noted as promising by others, with the Center being named as one of 21 initiatives showcased in the report "Beacons of Hope: Accelerating Transformations to Sustainable Food Systems" by the Global Alliance for the Future of Food in 2019. The initiatives profiled from across the world are working in diverse ways to achieve sustainable, equitable, and secure food systems.

In close collaboration with the ETH Zurich Foundation, the Center established its strategic partnership network specifically to engage with industry and foundation partners who support our vision and mission through programs and projects. The strategic partnerships of the WFSC have been coordinated through our Partnership Council, which met as a group twice per year. In Phase II, the Partnership Council members were Mercator Foundation Switzerland, Coop, Bühler, Migros, Fenaco, Nestlé, and Syngenta Crop Protection.

We work with collaborative partners who bring important and complementary expertise and networks to the table.



Member groups of the World Food System Center in 2020 (also see in Appendix).



Partnership Council meeting at Frey Chocolate, Buchs, Switzerland in 2018.



«The BeneComb project is highly interdisciplinary, combining fundamental biology with applied agriculture, and offers great opportunities for doctoral and undergraduate students.»

Monika Maurhofer,
Professor of Plant Pathology

RESEARCH

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

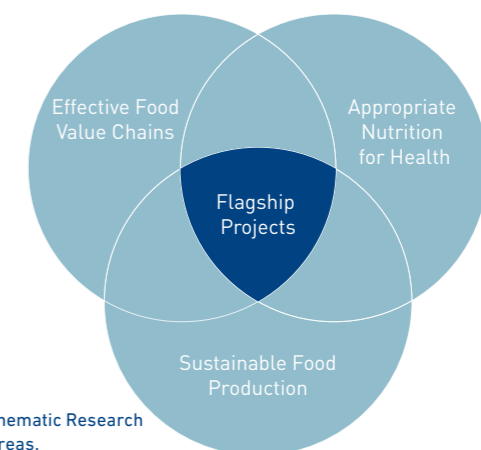
The World Food System Center enables novel interdisciplinary research that contributes knowledge and solutions to key food system challenges. The Center's core research activities also strive to provide leadership and foresight on issues connected to food and nutrition security based on innovative solutions for pressing problems of the world food system. In order to do so, the Executive Office fosters and manages competitive research programs, develops and supports Flagship projects, and engages in special collaborations.

Research promotion and support builds directly on the strengths of our 46 members. Therefore, various activities are planned to promote inter- and transdisciplinary research projects and to support our members in identifying funding opportunities and in coordinating targeted activities for successful application for research funding. Research results are then incorporated in various education and outreach projects to ensure highlighting of promising pathways to support a sustainable transition of food systems. The work contributes directly to many of the United Nations Sustainable Development Goals, including Zero Hunger, Sustainable Consumption and Production, and Good Health and Well-Being.

Thematic Research Focus Areas

The WFSC adopts a systems perspective to its research that takes place within interlinked thematic focus areas: *Effective Food Value Chains*, *Appropriate Nutrition for Health*, and *Sustainable Food Production*. They guide the Center's research initiatives and connect it to food system challenges of societal relevance. 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. Flagship research projects showcase a 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.

We connect researchers from different disciplines with one another and with external partners.



WFSC Thematic Research Focus Areas.

Flagship Projects

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. All Flagship projects should be visionary and potentially high risk; take a food systems or whole of value chain approach; involve at least three investigators from different disciplines; and involve key stakeholders from industry, government, and NGOs, in non-competitive roles. Topics for future Flagship projects are currently in development. Learn more at www.worldfoodsystem.ethz.ch/research/flagship-projects.

Research Programs

The Center's Research Programs support new cross-disciplinary and solution-oriented research to address food system challenges. In Phase II, the Mercator Research Program on Organic Production Systems for Global Food Security and the Coop Research Program on Sustainability in Food Value Chains provided support for doctoral and postdoctoral projects. All projects were subject to a rigorous evaluation by an independent academic panel with external reviews and an assessment process that took into account scientific excellence and relevance to the programs. These programs have funded 33 projects (see Appendix) totaling nearly 9 million CHF to date. Learn more about all the projects at www.worldfoodsystem.ethz.ch/research-programs.

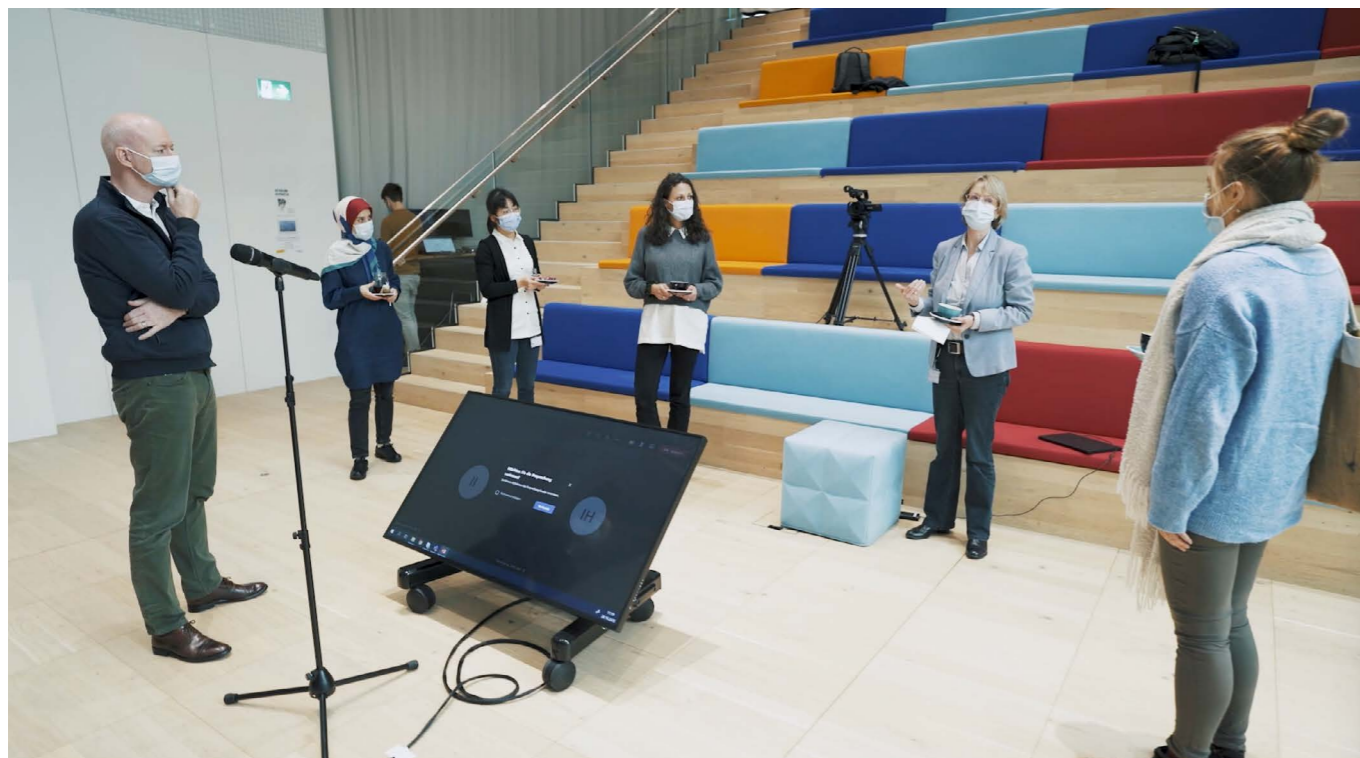
Future Food Initiative

ETH Zurich and EPFL launched Future Food – A Swiss Research Initiative (“Future Food Initiative”) in 2018 together with Swiss food industry leaders Bühler, Givaudan, and Nestlé. The goal of this initiative is to expand research and education in the area of food and nutrition sciences. The fellowship program within the initiative aims at bringing together competences from academic and industrial research in this field. The program is co-managed by the WFSC and the Integrative Food Science and Nutrition Center at EPFL and made possible by 4.1 million CHF in donations.

We fund research projects that support education and training of early career scientists.

The fellowship provides personal research funds for three years that enable postdoctoral fellows to work on their projects in a research laboratory with a host professor at ETH Zurich or EPFL. Calls for the program were held in 2019 and 2020, and seven fellows have already started novel research projects. In total, the initiative provides fellows, host professors, and the Center a great opportunity to further develop collaborations with industry and EPFL. Together, all partners of the initiative are building a strong Swiss food science ecosystem. Learn more about the program at www.futurefoodinitiative.ch.

Future Food Fellows visit Bühler Group in October 2020 and exchange with Ian Roberts, CTO, and Beatrice Conde-Petit, Food Science Officer.



Mercator Research Program in Organic Production Systems for Global Food Security

The program aims to explore the role and potential of organic production systems (certified or non-certified) to contribute to global food security. It has supported a total of 14 doctoral research projects since 2012, with 3.7 million CHF distributed. The program is funded through a donation by the Mercator Foundation Switzerland. One example of real-world research enabled through this program is the project “Resilience of Organic and Conventional Production Systems to Drought” (RELOAD), in which the ETH Zurich Grassland Sciences Group collaborates with researchers at Agroscope to investigate the drought resistance of Swiss arable farming systems.



The main objective of the RELOAD project is to compare the responses of the main Swiss arable land farming systems to simulated summer drought using portable roofs.



Researchers in the Sustainable Food Processing Group identify, design, and validate processes to enable microalgae-derived proteins for food applications.

Coop Research Program on Sustainability in Food Value Chains

The Coop Research Program supports research looking at ways to drive food value chains towards the goals of quality and quantity that support human and environmental health and create value for all stakeholders. Funded through a donation by the Coop Sustainability Fund, the program has supported a total of 19 two-year postdoctoral research projects, with 5 million CHF distributed. The project “New sustainable food formulations based on algae proteins” displays the innovative work enabled by this program. The project, led by the Sustainable Food Processing Group, achieved interdisciplinary development and analysis of processing technologies focused on algae protein.

Migros Direct Selection Projects

Through a special direct selection funding mechanism, Migros Industry representatives and WFSC members meet to exchange needs and ideas and to co-create research projects. The WFSC has had a crucial role in facilitating and moderating the identification of relevant topics for both industry and science. This has been achieved through linking Migros divisions with relevant member expertise, bilateral discussions, as well as the organization of workshops. Thus far, 11 projects have been supported with nearly 900'000 CHF.



Direct selection projects bring scientists and researchers together on issues of relevance to consumers, such as a project looking at Swiss consumer acceptance of sugar alternatives.



«The Mercator project funding changed my whole life trajectory. It allowed me to make a contribution to the important issue of nutrient cycling and engage with work that is fulfilling and impactful in the continuation project RUNRES.»

Ben Wilde,
Mercator Research Program Alum and
RUNRES postdoctoral researcher



Flagship projects are envisioned as large-scale research initiatives around critical food system topics.

Special Collaborations

The Center engages in practice-oriented research via special projects with partners to support real-world agenda setting and decision-making. The role of the WFSC in these projects is not necessarily to conduct research but rather to support the project teams by providing the Center's expertise in education and outreach. Examples of such activities 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" (YAMSYS), led by WFSC member Emmanuel Frossard. The Center also acted as an education and outreach partner in the international consortium project "Delivering Food Security on Limited Land (DEVIL)", funded by the Belmont Forum and FACCE-JPI initiative, with WFSC member Nina Buchmann as co-PI. The World Food System Summer School was organized in partnership with these consortia from 2017 to 2019.

Research into Practice

Research supported by the Center often takes place abroad, with co-creation of solutions for local stakeholders an important component. Throughout Phase II, Center staff and researchers continually developed tools to share research approaches and findings with practitioners and the global public. Fact sheets, reports, websites, workshops, and even role-play games provided channels and venues for exchange.

The Center and its members further engage with stakeholders by establishing project advisory boards with multi-sector participation and engaging in diverse forums and bodies. For example, Executive Director Martijn Sonneveld represents ETH Zurich in the Swiss National Committee of the UN FAO (CNS-FAO), a position nominated by the federal council. He was elected President of the committee in January 2020.

We strive to create actionable knowledge to be shared in dialogue with a wide audience.

Enhancing Resilience in Food Systems

The Center's first Flagship project was initiated in 2014 as a collaboration of the Sustainable Agroecosystems Group, Climate Policy Group, and the Transdisciplinarity Lab. WFSC member 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 (FOAG), the UN FAO, multi-national companies and organizations, and academic partners.

This project developed well in Phase II, and numerous stakeholder workshops, surveys, and interviews were performed to design and evaluate interventions for building resilience in selected food systems. In 2019, an eight-year project looking at improving city region food system resilience in several African countries (RUNRES) received funding from the Global Program Food Security of the SDC, thereby extending the duration of the Flagship project until 2026.

Novel Proteins for Food and Feed

This project, started in 2016, aims to enable the broad exploration of microalgae and insect proteins for more sustainable food and feed. WFSC member Alexander Mathys leads the multifaceted project, and components include defining target properties and functionalities of the novel proteins, gaining insights from a consumer perspective, and using a system-oriented approach to assess sustainability.

After a first workshop to establish collaboration in January 2017, the initiative started developing further. Prof. Mathys has introduced the Flagship project at numerous events and organized a symposium at the American Association for the Advancement of Science AAAS 2018 Annual Meeting. Several subprojects are underway, including the newly funded Swiss National Science Foundation Synergia project encouraging more intensive use of microalgae in the fuel, feed, food and health industries. Individual projects have close ties with partners from outside ETH Zurich, including Nestlé, Bühler, Givaudan, and Coop/Hilcona. Project results are often highlighted in media outlets.

Digitalization in Agriculture

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. The workshop "Challenges of Digitalization in the Agro-Food Sector" in 2017 and the "Smart Farming – Was heisst das für die Schweiz?" event with the participation of Bundesrat Schneider-Ammann in 2018, helped cement the position of ETH Zurich as a leader in the field. AgriTech Day 2019, organized by the ETH Studio AgroFood and the WFSC, also contributed to bringing the topic of Smart Farming closer to the Swiss population.

A major achievement of the project was the development and running of an ETH Zurich 10-week course "Innovation in Precision Agriculture" in collaboration with the Chair of Entrepreneurship and the Student Project House in 2018 and 2019. Students interacted with experts from the sector to develop and prototype solutions to a challenge of their choice.



EDUCATION

The education activities of the Center focus on building capacity in the next generation of decision makers to provide leadership for sustainable food systems issues.

The World Food System Center aims to support young talents from ETH Zurich and the world to become the next generation of leaders to tackle complex food system challenges. The Center focuses, therefore, on supplementing ETH Zurich curricula with innovative approaches to education that teach participants to navigate complexity and build sustainable food systems.

The Center organizes a range of education activities including intensive summer schools 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 create and foster a global, interdisciplinary community of WFSC alumni.

Research Meets Education

The Center also plays a role in connecting the latest research at ETH Zurich to education opportunities. For example, Center staff facilitated collaboration 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 prototyped and iterated in the 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 was presented to policy makers at the Yam Forum in Abidjan in 2019.

Our education courses support and inspire future change makers in the food system.

World Food System Summer Schools 2016-2020	
Summer School courses organized	4
Students participating	98
Countries represented	54
Instructors and contributors involved	115

Summer Schools

The educational programs of the Center are developed for students and young professionals and designed to explore all aspects of the food system. 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 two-week intensive course. During Phase II, the course was hosted in Switzerland (2016, 2019), South Africa (2017), and Côte d'Ivoire (2018).

This course incorporates a diversity of interactive 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.

The courses in 2017 and 2019 were part of the research project Delivering Food Security on Limited Land, and the course in 2018 was held in partnership with r4d YAMSYS project. Both projects were financially supported by the Swiss National Science Foundation. Throughout Phase II, the summer schools were also financial supported by Mercator Foundation Switzerland. Find out more: www.worldfoodsystem.ethz.ch/education/summer-schools.

The WFS Summer School covers a wide variety of food system issues through interactive sessions on topics such as nutrition and health, systems thinking, climate change and biodiversity loss, agroecology, and seed production.



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. The authors also shared some challenges faced and lessons learned.

The Rich Picture Method

In September 2019, the research paper "The Rich Picture Method: A simple tool for reflective teaching and learning about sustainable food systems" was published by Michelle Grant, Anna Gilgen, and Nina Buchmann in the journal *Sustainability*. The research was based on the use of an adapted rich picture method over three years of the World Food System Summer School in different locations around the world. The paper specifically looked at the efficacy of the tool to identify the knowledge gained by participants as the result of the course. The results show the method is a very useful and can be applied in a wide range of sustainability or complex systems education.

Our courses motivate life-long learning and engagement in creating change.

Summer School 2017: South Africa

In summer 2017, 25 students and young professionals joined the 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, the students followed the food value chain, interacting with key stakeholders and experts at each step of the way. The use of a combination of didactic tools, including lectures, workshops, panels, facilitated discussions, field trips, case studies, role-plays, 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.



Students engaged with community food projects in Khayalitsha Township, South Africa to gain insight into local farming and indigenous crops.



WFS Summer School students visit yam farmers and villagers in rural Côte d'Ivoire.

Summer School 2018: Côte d'Ivoire

In January 2018, 26 graduate students and young professionals from around the world participated in the WFS Summer School in Côte d'Ivoire, held in collaboration with the Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS). The course focused on food systems in rapid transition and how to deal with their complexity. 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 focused on the cacao value chain and understanding the challenges and opportunities facing this cash crop and those involved in its production.

Summer School 2019: Switzerland

In August 2019, the WFS Summer School returned to Rheinau, Switzerland, with 24 participants from 18 different countries coming together to explore sustainable food systems through an interactive and engaging learning program. After an in-depth introduction into world food systems, the students worked on three real-life case studies. Divided into interdisciplinary and intercultural teams, students went through an adapted design thinking process and developed innovative solutions to challenges in regional food networks in Nepal, Portugal, and Switzerland. The three representatives of the local food networks were very enthusiastic about the proposed ways to create sustainable change and motivated to take these ideas to their communities and try them out in practice.



Visiting local producers in the Berner Oberland region of Switzerland, the students were struck by the reality of Alpine farming.



«I am thrilled to see the shared motivation among many of us alumni: to keep in touch, exchange ideas and discuss food systems. With the alumni support, we have the perfect platform to keep learning and contributing to more sustainable food systems»

Nora Bartolomé Gutiérrez,
WFSC Alumni Network Community Coordinator
(2019-2020)

The WFSC Alumni Network

Through the Center's educational activities, a growing interdisciplinary and global community of alumni has been created. In 2020, this community boasted 213 alumni from over 50 countries.

The vision of the Center is to foster a collaborative alumni network. In 2017, the Center took the steps to begin formalizing this network and mobilizing it to create ongoing impact through continued exchange and joint projects. This process was catalyzed through a survey sent to all alumni. The insights gained from the survey were further enriched through a workshop with a focus group of alumni held in Berlin in June 2018. The workshop ended with the creation of an interim volunteer board who developed a strategy for the establishment of an alumni organization and the associated activities.

In 2019, the WFSC alumni community founded the WFSCAN (World Food System Center Alumni Network). The vision of the organization is to cultivate a collaborative international network that inspires and leads change towards sustainable food systems, with the mission to support alumni-driven initiatives that encourage connecting, learning, and contributing. Three board members run the organization and coordinate learning experiences, events, and workshops as well as an online platform at www.wfscalumni.com.

Recent activities of the WFSCAN include a study tour and solution design workshop at an organic farm and seed production facility in Assam, India in 2020. Also, a series of professional skills workshops were held to support the professional development of alumni on themes such as time management, mindfulness, and career development.

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.

Food System Stories Blog

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 43 stories by the end of the 2020.

Read the stories at www.foodsystemstories.org.

We support the WFSCAN as a platform for alumni, by alumni.



The Center provides a portfolio of opportunities for ETH students to learn about the food system through extra-curricular courses and excursions.

Food Security and Resilient Food Systems at FAO

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 three-day course for ETH Zurich Master's students at the FAO headquarters in Rome.

The course in April 2018 focused on food security in an urbanized world and coincided with the Second International Symposium on Agroecology. The students, thus gained the experience of joining an international symposium held at the FAO as part of the Swiss delegation.

The course in April 2019 focused on achieving food security in a world impacted by climate change. During the visit to Rome, the students were able to voice their ideas at an FAO event on agroecology. At the event, WFSC Education Director Michelle Grant, in her function as member of the Swiss National Committee of the UN FAO (CNS-FAO), presented a keynote on a new paper focusing on the role of agroecology in achieving the Sustainable Development Goals.

Excursions

Field trips and excursions play a critical role in the ETH Zurich curriculum. Excursion offerings for Bachelor and Masters students from the Center address food system challenges in a cross- and trans-disciplinary manner.

In partnership with Bachsermärt, a local grocery cooperative, the Center offered an excursion where ETH students explored regional food networks in Zurich (2015, 2016, 2018). By looking at the Bachsermärt as a case study, the students learned that strong commitment is needed from all actors involved to build sustainable regional food networks, as these networks must compete against the existing, functioning globalized food systems to succeed.

In 2017, the "Digitalization in Agriculture" excursion took ETH students to visit the startups of Ecorobotix, based in Yverdon-les-Bains, and Gamaya, based in Lausanne. Each start-up demonstrated their innovative technologies, allowing students to see practical digital technologies in action and discuss with the entrepreneurs.

Exchange and Learning Visit

Over ten days in June 2019, the WFSC hosted 20 bachelor students from Assam Agricultural University in India for an Exchange and Learning Visit. During the exchange, the students explored challenges in the food system, specifically focusing on organic production systems and the differences between the Indian and Swiss agricultural systems.

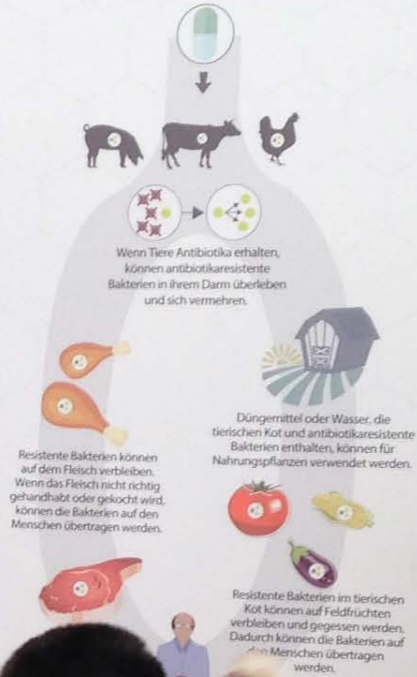
Classroom sessions featured topics such as complex systems and policy perspectives, while field visits allowed deeper learning about organic farming systems, smart farming technologies, and aquaponics. Contributor presentations introduced innovative ideas from start-ups, industry, and research.

The visiting students found the presentations and open discussions with all the contributors truly inspiring. Many commented on the growth of their understanding of challenges, solutions, and trade-offs in complex systems; on gaining new ideas for their future; on learning about the potential of organic agriculture; and on growing in personal confidence.

of the Future

nährungssystem der Zukunft nachhaltig zu entwickeln. Forschende in den Agrar- und Lebenswissenschaften innovative Lösungen. Neue Technologien und die Digitalisierung haben das Potenzial, die wirtschaftliche Produktion effizienter zu machen und natürliche Ressourcen zu schonen.

Einige resistente Infektionen können von der Nahrung ausgehen, die wir zu uns nehmen.



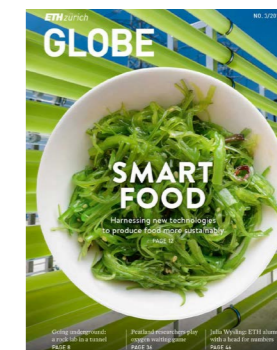
OUTREACH

The Center engages with a broad audience to increase awareness about challenges in the world food system and approaches to creating solutions.

The World Food System Center (WFSC) strives to create actionable knowledge to be shared in dialogue with a wide audience. Such dissemination accelerates the transformation of food systems and thereby supports the achievement of the UN Agenda 2030 Sustainable Development Goals. The Center's outreach activities aim to increase awareness and dialogue around the challenges of the world food system and possible solutions. Events bring science directly from the scientists to a wide range of interested stakeholders in Switzerland and abroad who profit from the information, from farmers to consumers.

These diverse stakeholders are engaged by using varied platforms and venues, ranging from public events and lectures, exhibitions and guided tours, webinars, and direct discussions. Such activities have reached thousands and, along with the Center communication channels, have made visible the expertise at ETH Zurich and its contribution to global challenges.

By allowing a broader scope for outreach than the focus areas that frame its research programs, the Center is able to explore the breadth of the food system, complementing the expertise of its members with the experience of colleagues and peers from outside ETH Zurich.



Globe Cover, September 2019

We aim to make contemporary food system research accessible to a wide audience.

The September 2019 edition of ETH GLOBE, the magazine of ETH Zurich and ETH Zurich Alumni, was dedicated to the diverse issues surrounding food and the search for sustainable solutions to prove food and nutrition security for a growing world population. Many Center members and projects supported through WFSC Research Programs were highlighted.

Public Events and Research Symposium

The Center organizes numerous scientific events aimed at increasing awareness of the informed public about both the challenges of the world food system and system-based approaches to addressing them. During Phase II, the Center held 32 public and specialist events, reaching 21,000 people (see Appendix). Many events were jointly organized with WFSC members and partner institutions. The participation of high-level presenters and guests helped to anchor the WFSC in important international and national networks.

In 2016, the Center established an annual research symposium to highlight food system research at ETH Zurich and featuring presentations from concluding research projects supported by its Research Programs. The annual event continued through Phase II, with a total of 24 presentations, 232 scientific posters, and over 1150 participants. The diverse audience, each year from over 50 organizations, provided a unique opportunity for young researchers to share their findings to a multitude of stakeholders, including the general public and university students. Feedback is continually positive for this distinct event that brings research from across the span of the food system together.

Research Dissemination

The Center prepares content, discovers opportunities for dissemination, and ensures that the Center with all its activities and projects communicates strategically and in coordination with ETH Corporate Communications efforts. The Center has established and manages its own communication platforms to further support these efforts.

In order to serve as a point of reference for food system research at ETH Zurich, efforts in Phase II focused on increasing the output and reach of Center communication platforms. The [Center's website](#) is a venue to communicate news and findings. The Center also produces a biannual newsletter, bringing news highlights and member updates to a network of over 1700 interested subscribers. The use of social media channels increased in Phase II, with [Twitter](#), [LinkedIn](#), and [YouTube](#) being added.

Due to the COVID-19 pandemic, ETH Zurich switched to emergency operations in March 2020; classes as well as outreach events moved online. During these challenging times, the Center shared stories via social media about how the pandemic was affecting food systems and food and nutrition security worldwide. Michelle Grant also highlighted effects of COVID-19 on food systems at a session of the ETH SDG Lecture Series in May. Looking forward, the Center plans to continue with some online events, taking the opportunity to reach a diverse, global audience.

We seek opportunities to disseminate results and raise awareness for work of ETH Zurich on food system challenges.

The Research Symposium 2019 focused on how current research contributes to sustainable food systems and supports reaching the Sustainable Development Goals of the UN Agenda 2030, with a keynote address by Detlef Günther, ETH Zurich VP of Research.



AgriTech Day

In May 2019, the ETH-Research Station for Plant Sciences, Strickhof, and AgroVet-Strickhof opened their doors under the motto "[Agriculture of the future - digital and sustainable?](#)" At numerous attractions, demonstrations, and forum discussions, the over 1000 visitors discovered innovative tools to support more sustainable Swiss agriculture. An important aspect of the day was the exchange of ideas and perspectives among all involved. The potential of smart farming for production and breeding while considering economics and environmental issues were discussed in the forum with inputs from several researchers from ETH Zurich. The event ended with a panel discussion about sustainable agriculture from the perspectives of research, education, politics, and practice.



Several robots, including ANYmal, Phenofly, and Husky, were at work during the "Field hands of the future" demonstrations at AgriTech Day with the ETH Zurich Crop Science Group.



Michelle Grant moderated the evening with panelists Robert Finger (ETH Zurich), Philipp Staudacher (Eawag), and Lothar Aicher (Swiss Center for Applied Human Toxicology).

Pesticides - What Does Science Say?

To provide a platform for a science-based discussion and address questions relevant for a broad audience on the topic of pesticides in agriculture and the consequences on the environment and human health, the [Center hosted a salon discussion in April 2019](#). Over 100 guests provided questions for the three expert panelists, which were discussed in a plenary session. Comments ranged from specific pesticide affects and how risk assessments are conducted to more system-based issues of how agricultural policy evolves. With a drink and a snack, all attending were then encouraged to continue the discussion with the panelists as well as with other invited researchers working on issues related to pesticide use in food systems.

World Food System Center Research Symposium

The annual World Food System Center Research Symposium highlights the research that the Center's Research Programs support as well other food system relevant research conducted by our member groups. The [symposium in December 2020](#) moved online as two distinct events: [Plant Breeding for Global Food Security Webinar](#) and Poster Session and Networking Event. The webinar, with two research presentations and a panel discussion, focused on plant breeding and the implications for global food security. The panelists highlighted how research contributes to the future of plant breeding and discussed the importance of global collaboration and capacity building. At the Poster Session, 15 young researchers presented their posters and could exchange in a networking area.



Experts from Switzerland, Uganda, and Colombia joined in the panel discussion at the Plant Breeding for Global Food Security Webinar.



«The WFSC really knows how to set up environments where exchange between different researchers, but also between non-researchers and researchers is possible. To me, the symposium was a perfect mix of a meeting among research friends and exchange with different people. I even invited friends and family once.»

Lukas Wille,
Mercator Research Program Alum and
Junior Scientist at FiBL, Frick



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. Examples of Enabling Grants project outcomes can be found on our Food System Stories blog.

Representation at Food Sector Events and Forums

Additionally, Center members and Executive Office staff regularly represent the Center at food system-themed events organized by Swiss and international groups. This engagement in diverse forums and bodies allows the Center to bring a food system perspective to the respective tables.

Further, the WFSC is also part of the Swiss Forum for International Agricultural Research (SFIAR), a multi-stakeholder platform that includes FOAG, SDC and major Swiss agricultural research institutions and NGOs. In December 2019, the Center organized the annual SFIAR meeting at ETH Zurich, and the WFSC Executive Director was appointed Vice President of the forum.

Our grants open new doors to opportunities that would have otherwise been unattainable.

WFSC Enabling Grants 2016 - 2020	2020	TOTAL
Grants distributed	14	50
- WFS Fund Program	5	21
- Ambassadors Program	9	29
Funding (CHF)	51'742	188'960

The Center collaborates with partners to jointly organize or host events that leverage the networks and expertise of each of the partners.

Sustainable Eating- One Meal at a Time

At the [online cooking event in November 2020](#), the focus was on cooking while learning more about the food system and exploring a few of the chosen ingredients. The guide to cooking a 3-course meal at home was prefaced with inputs on social and environmental issues in the food system. Michelle Grant (WFSC), gave an introduction to food system challenges, then Linn Borgen Nilsen (NADEL) elaborated on the social aspect of sustainable consumption. Akanksha Singh (Agricultural Ecology Group), then shared insights from her research on intercropping and extolled the many benefits of legumes like beans for both soil quality and nutrition.

The cooking then heated up, with Susanne Tobler from TASTELAB introducing the menu. Over 270 participants joined the event, with more than half of those cooking in a team. While cooking and eating, many participants shared images on an online mood board, displaying the fun atmosphere in so many kitchens around the world. The event ended with a mindful eating exercise. The event was organized by the Center, NADEL, and the Student Sustainability Commission.

Scientifica "Science Days" 2017, 2019

Every two years, the University of Zurich and ETH Zurich open their doors to the public for Scientifica or "Science Days." They dedicate an entire weekend to a single topic that is related to the research of scholars from a variety of disciplines at both universities.

At the event in September 2017, researchers from the Sustainable Agroecosystems Group and Crop Science Group joined with the PubliFarm outreach project for the Center's exhibit "[Sustainable Nutrition with Bits and Bytes](#)." The activities focused on how an influx of data from information and communication technologies is changing the food system.

The Center then organized the interactive exhibit "[Food of the Future](#)," focused on innovations creating more sustainable agricultural and food systems, in September 2019. Researchers from the Crop Science Group and the Laboratory for Food Immunology shared their work with visitors with a virtual reality experience and even a Pig Pong game, as a way to introduce the concept behind newly developed vaccines for livestock.

OLMA 2017-2019

Every year, food and agricultural companies and institutions gather in St. Gallen for the OLMA Swiss Fair for Agriculture and Nutrition, the most popular public fair in Switzerland. In 2017, the Center was part of the special exhibit entitled Playful Sustainable Shopping «Spielend zum nachhaltigen Einkauf», the PubliFarm project introducing the public to scientific research in the field of biodiversity and climate change.

In 2018 and 2019, ETH Zurich joined the special show "Experience Food." The [exhibit in 2018](#) highlighted ETH Zurich's innovative research on our food system, specifically the sustainable production of cereals, and attracted over 16,000 visitors during ten days in October. Center staff assisted in creation of the exhibit along with ETH Zurich Rector's Staff and the Plant Science Center. In addition, the Center created [a series of five short videos](#) focused on the Enhancing Resilience in Food Systems Flagship project on the tef value chain in Ethiopia. In 2019, the Center again created content for the exhibit, namely the stand "How can we produce food sustainably?"

Appendix

World Food System Center Members

Members

* Indicates Member of Steering Committee

** Indicates Chair of Steering Committee

D-USYS							
 *PROF. NINA BUCHMANN Grassland Sciences	 *PROF. CONSUELO DE MORAES Biocommunication and Ethnology	 *PROF. SEBASTIAN DÖTTERL Soil Resources	 *PROF. PETER EDWARDS Singapore ETH Centre	 *PROF. EMMANUEL FROSSARD Plant Nutrition	 *PROF. JABOURY GHAZOUL Ecosystem Management	 *PROF. RACHEL GARRETT Environmental Policy	
D-USYS							
 *PROF. RUBEN KRETZSCHMAR Soil Chemistry	 *PROF. MICHAEL KREUZER Animal Nutrition	 DR. PIUS KRÜTTLI USYS TILab	 *PROF. ANDREAS LÜSCHER Forage Production and Grassland	 *PROF. BRUCE McDONALD Plant Pathology	 *PROF. HUBERT PAULSCH Animal Genomics	 *PROF. CHRISTIAN SCHÜB Agricultural Ecology	
D-USYS							
 *PROF. RAINER SCHULIN Soil Protection	 *PROF. SONIA SENEVIRATNE Land-Climate Dynamics	 *PROF. JOHAN SIX Sustainable Agroecosystems	 *PROF. BRUNO STUDER Molecular Plant Breeding	 *PROF. SUSANNE E. ULBRICH Animal Physiology	 *PROF. THOMAS VAN BOREKEL Health Geography and Policy	 *PROF. ACHIM WALTER Crop Science	
D-USYS		D-USYS & D-MTEC		D-HEST			
 *PROF. LENY WINKEL Animal Biotechnology	 *PROF. ROBERT FINGER Agricultural Economics and Policy	 *PROF. CHRISTOPHE LACROIX Food Biotechnology	 *PROF. MARTIN LOESSNER Food Microbiology	 *PROF. ALEXANDER MATHYS Sustainable Food Processing	 *PROF. RAFFAELE MEZZENGA Food and Soft Materials	 *PROF. LAURA NISTRÖM Food Biobiochemistry	
D-HEST							
 *PROF. MICHAEL SIEGRIST Consumer Behavior	 *PROF. SHANA STURLA Toxicology	 *PROF. EMMA WETTER-SLACK Food Immunology	 *PROF. FERDINAND VON MEYENN Nutrition and Metabolic Epigenetics	 *PROF. ERICH WINDHAB Food Process Engineering	 *PROF. CHRISTIAN WOLFRUM Translational Nutrition Biology	 *PROF. MICHAEL B. ZIMMERMANN Human Nutrition	
D-GESS		D-BIOL		D-ARCH		D-BAUG	
 *PROF. ISABEL GÜNTHER Development Economics	 *PROF. WILHELM GRÜSSLER Plant Biotechnology	 *PROF. SAMUEL C. ZEEMAN Plant Biochemistry	 *PROF. BERNHARD SCHMITT Information Architecture	 *PROF. STEFANIE HELLWEG Ecological Systems Design	 DR. JAN DIRK WEGNER Eco/Innovation Lab	 *PROF. RENÉ BOSSI Bio-based Membranes and Textiles	
Eawag							
 DR. CHRISTIAN STAMM Environmental Chemistry	 *PROF. HONG YANG Water, Environment and Food Security	 *DR. CHRISTIAN ZURBRÜGG Water and Sanitation					

Appendix

Research projects funded through WFSC Research Programs 2016 – 2020

Project Title	Time Frame	Principal Investigator	Amount [CHF]	Program
Non-thermal plasma as a sustainable intervention technology to improve shelf life and safety of sprouted seeds	2016-2018	Markus Schuppler, Food Microbiology	223'592	CRP
Soft matter approach to effective preservation of African Leafy Vegetables (ALVs) by drying by desiccant / solar hybrid system	2016-2019	Raffaele Mezzenga, Food and Soft Materials	280'530	CRP
Assessing and enhancing the resilience of the tef and cocoa value chains	2016-2018	Anthony Patt, Climate Policy	249'840	CRP
Developing a sustainable value chain of Brazil nuts (<i>Bertholletia excelsa</i>) for Swiss consumers: an interdisciplinary approach	2016-2019	Chris Kettle, Ecosystem Management	278'010	CRP
Ecological intensification of organic rooibos cultivation in South Africa	2016-2019	Emmanuel Frossard, Plant Nutrition	283'540	MRP
Improving disease resistance of pea through selection at the plant-soil interface	2016-2020	Bruno Studer, Molecular Plant Breeding	271'670	MRP
Global organic agriculture: challenges and opportunities	2016-2022	Stephan Pfister, Ecological Systems Design	268'994	MRP
Nitrified urine as fertilizer: A trans-disciplinary approach to solutions-oriented community development	2016-2019	Johan Six, Sustainable Agroecosystems	249'726	MRP
New sustainable food formulations based on algae proteins	2017-2019	Alexander Mathys, Sustainable Food Processing	279'935	CRP
Application of lactobacillus reuteri to naturally prevent campylobacter colonization of chicken	2017-2019	Christophe Lacroix, Food Biotechnology	274'700	CRP
Increasing genetic gain in climbing bean breeding	2018-2021	Bruno Studer, Molecular Plant Breeding	350'000	CRP
Resilience of organic and conventional production systems to drought	2017-2020	Nina Buchmann, Grassland Sciences	428'843	MRP
Assessing the role of organic value chains in enhancing food system resilience	2017-2021	Johan Six, Sustainable Agroecosystems	284'709	MRP
Understanding the effects of irrigation modernization in water resources management – citrus production in the Jucar river basin, Spain	2018-2020	Hong Yang, Eawag	266'686	CRP
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	2018-2021	Michael Kreuzer, Animal Nutrition	180'000	MRP
Biological control of soilborne insect pests using combinations of plant-beneficial fluorescent pseudomonads with insecticidal activity, entomopathogenic nematodes and entomopathogenic fungi	2018-2022	Monika Maurhofer, Plant Pathology	297'963	MRP
Sustainable intensification through agroecosystem diversification: optimizing organic bean production in Macedonia	2019-2021	Christian Schüb, Agricultural Ecology	299'673	CRP
Dynamic agroforestry systems for sustainable intensification of cocoa production in West Africa	2019-2021	Johan Six, Sustainable Agroecosystems	270'000	CRP
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	2019-2021	Michael Zimmermann, Human Nutrition	235'495	CRP

MRP= Mercator Research Program
CRP = Coop Research Program

Appendix

Publications from WFSC Research Program Projects 2016–2020

Asare, P. T.; Greppi, A.; Stettler, M.; Schwab, C.; Stevens, M. J. A.; Lacroix, C. (2018) Decontamination of Minimally-Processed Fresh Lettuce Using Reuterin Produced by *Lactobacillus reuteri*. *Frontiers in Microbiology*, <https://doi.org/10.3389/fmicb.2018.01421>.

Böcker, S.L.; Ortmann, S.; Surber, J.; Leeb, E.; Reineke, K.; Mathys, A. (2019) Biphasic short time heat degradation of the blue microalgae protein phycocyanin from *Arthrospira platensis*. *Innovative Food Science & Emerging Technologies* 52: 116-121.

Brouwer, R.; Chiriboga, F.; Jansen, M.; Ehrenberg, F.; Vargas, F.; Guariguata, M.; Kettle, C.; Bardales, R.; Corvera, R.; García Roca, M.; Zuidema, P. (2019) Brazil nut growth and production in enrichment planting practices in Peru. In preparation.

Buchmann, L.; Bloch, R.; Mathys, A. (2018) Comprehensive pulsed electric field (PEF) system analysis for microalgae processing. *Bioresource Technology* 265: 268-274.

Buchmann, L.; Böcker, L.; Frey, W.; Haberkorn, I.; Nyffeler, M.; Mathys, A. (2018) Energy input assessment for nanosecond pulsed electric field processing and its application in a case study with *Chlorella vulgaris*. *Innovative Food Science & Emerging Technologies* 47: 445-453.

Buchmann, L.; Frey, W.; Gusbeth, C.; Ravaynia, P. S.; Mathys, A. (2019) Effect of nanosecond pulsed electric field treatment on cell proliferation of microalgae. *Bioresource Technology* 271: 402-408.

Cagnarini, C.; Renella, G.; Mayer, J.; Hirte, J.; Schulin, R.; Costerousse, B.; Della Marta, A.; Orlandini, S.; Menichetti, L. (2019) Multi-objective calibration of RothC using measured carbon stocks and auxiliary data of a long-term experiment in Switzerland *European Journal of Soil Science* 70:819.

Caporgno, M. P.; Böcker, L.; Müssner, C.; Stirnemann, E.; Haberkorn, I.; Adelman, H.; Handschin, S.; Windhab, E. J.; Mathys, A. (2020) Extruded meat analogues based on yellow, heterotrophically cultivated *Auxenochlorella protothecoides* microalgae. *Innovative Food Science & Emerging Technologies* 59: 102275.

Caporgno, M. P.; Mathys, A. (2018) Trends in microalgae incorporation into innovative food products With potential health benefits. *Frontiers in Nutrition* 5:58.

Chiriboga-Arroyo, F.; Jansen, M.; Bardales-Lozano, R.; Ismail, S.A.; Thomas, E.; García, M.; Gomringer, R.C.; Kettle, C.J. (2020) Genetic threats to the Forest Giants of the Amazon: Habitat degradation effects on the socio-economically important Brazil nut tree (*Bertholletia excelsa*). *People Plants Planet* 2: 194-210

Conz, R.F. Six, J.; Andrade, M.I.; Pereira, E.I.P. (2021) Soil fertility maintenance with organic amendments to orange fleshed sweetpotato. *Nutrient Cycling in Agroecosystems* 119: 213–229.

Costerousse, B.; Schönholzer-Mauclair, L.; Frossard, E.; Thonar, C. (2018) Identification of heterotrophic zinc mobilization processes among bacterial strains isolated from wheat rhizosphere (*Triticum aestivum* L.). *Applied and Environmental Microbiology* 84: e01715-17.

Engbersen, N.; Gramlich, A.; Lopez, M.; Schwarz, G.; Hattendorf, B.; Gutierrez, O.; Schulin, R. (2019). Cadmium accumulation and allocation in different cacao cultivars. *Science of The Total Environment* 678: 660-670.

Fekry MI, Engels C, Zhang J, Schwab C, Lacroix C, Sturla SJ, Chassard C (2016) The strict anaerobic gut microbe *Eubacterium hallii* transforms the carcinogenic dietary heterocyclic amine 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP). *Environmental Microbiology Reports* 8: 201–209.

Gangnat, I. D. M.; Mueller, S.; Kreuzer, M.; Messikommer, R. E.; Siegrist, M.; Visschers, V. H. M. (2018) Swiss consumers' willingness to pay and attitudes regarding dual-purpose poultry and eggs. *Poultry Science* 97:1089-1098.

Garland, G.; Banerjee, S.; Edlinger, A.; Oliveira, E.M.; Herzog, C.; Wittwer, R.; Philippot, L.; Maestre, F.T.; van der Heijden, M.G.A. (2020) A closer look at the functions behind ecosystem multifunctionality: A review. *Journal of Ecology* 109:600–613.

Grandl, F., Luzi, S.P., Furer, M., Leiber, F., Ortmann, S., Clauss, M., Kreuzer, M., Schwarm, A. (2016) Biological implications of longevity in dairy cows: 1. Changes in feed intake, feeding behavior, and digestion with age. *Journal of Dairy Science* 99(5): 3457-3471.

Grandl, F., Luzi, S.P., Furer, M., Leiber, F., Ortmann, S., Clauss, M., Kreuzer, M., Schwarm, A. (2016) Biological implications of longevity in dairy cows: 2. Changes in feed intake, feeding behavior, and digestion with age. *Journal of Dairy Science* 99(5): 3472-3485.

Grandl, F., Zeitz, J.O., Clauss, M., Furger, M., Kreuzer, M., Schwarm, A. (2018) Evidence for increasing digestive and metabolic efficiency of energy utilization with age of dairy cattle as determined in two feeding regimes. *Animal* 12(3): 515-527.

Grandl, F.; Furger, M.; Kreuzer, M.; Zehetmeier, M. (2019) Impact of longevity on greenhouse gas emissions and profitability of individual dairy cows analysed with different system boundaries. *Animal* 13: 198–208.

Grandl, F.; Schwarm, A.; Ortmann, S.; Furger, M., Kreuzer, M., Clauss, M. (2018) Kinetics of solutes and particles of different size in the digestive tract of cattle of 0.5–10 years of age, and relationships with methane production. *Journal of Animal Physiology and Animal Nutrition* 102: 639-651.

Grüter R, Meister A, Schulin R, Tandy S (2018) Green manure effects on zinc and cadmium accumulation in wheat grains (*Triticum aestivum* L.) on high and low zinc soils. *Plant Soil* 422: 437-453.

Grüter, R.; Costerousse, B.; Bertoni, A.; Mayer, J.; Thonar, C.; Frossard, E.; Schulin, R.; Tandy, S. (2017) Green manure and long-term fertilization effects on soil zinc and cadmium availability and uptake by wheat (*Triticum aestivum* L.) at different growth stages. *Science of the Total Environment* 599-600: 1330-1343.

Grüter, R.; Costerousse, B.; Mayer, J.; Mäder, P.; Thonar, C.; Frossard, E.; Schulin, R.; Tandy, S. (2019) Long-term organic matter application reduces cadmium but not zinc concentrations in wheat. *Science of the Total Environment* 669: 608-620.

Helfenstein, J.; Müller, I.; Grüter, R.; Bhullar, G.; Mandloi, L.; Papritz, A.; Siegrist, M.; Schulin, R.; Frossard, E. (2016) Organic wheat farming improves grain zinc concentration. *PLoS ONE* 11: e0160729.

Heuel, M.; Sandrock, C.; Mathys, A.; Gold, M.; Zurbrugg, C.; Kreuzer, M.; Terranova, M. (2020) Black soldier fly larvae as a substitute for soybean in the diets of laying hens: Insect as feed/alternative protein sources & diet formulations. *J. Insects Food Feed*, 6(1).

Heuel, M.; Sandrock, C.; Leiber, F.; Mathys, A.; Gold, M.; Zurbrugg, C. Gangnat, I.D.M.; Kreuzer, M. Terranova, M. (2021) Black soldier fly larvae meal and fat can completely replace soybean cake and oil in diets for laying hens. *Poultry Science*. 4:101034

Jansen, M.; Guariguata, M.; Chiriboga, F.; Quaadvlieg, J.; García Roca, M.; Vargas, F.; Arroyo Quispe, E.; Kettle, C. (2021) Forest degradation and inter-annual tree level Brazil nut production in the Peruvian Amazon. *Frontiers in Forests and Global Change*.

Jansen, M.; Guariguata, M.; Raneri, J.; Duchelle, A.; Quaadvlieg, J.; Chiriboga, F.; Kettle, C. (2020) Food for thought: the underutilized potential of tropical tree-based foods for 21st century sustainable food systems. *People and Nature* 4: 1006-1020.

Keller, B.; Ariza-Suarez, D.; de la Hoz, J.F.; Aparicio, J.S.; Portilla Benavides, A.E.; Buendia, H.F.; Mayor, V.M.; Studer, B.; Raatz, B. (2020) Genomic predictions in common bean under different environmental stresses. *Frontiers Plant Science*.

Loaiza Puerta, V., Pereira, E., van der Heijden, M., Wittwer, R., Six, J. (2018) Improvement of soil structure through organic crop management, conservation tillage and grass-clover ley. *Soil and Tillage Research* 180: 1-9.

Loaiza Puerta, V.; Six, J.; Wittwer, E.; van der Heijden, M.; Pujol Pereira, E. I. (2019) Comparable bacterial-mediated nitrogen supply and losses under organic reduced tillage and conventional intensive tillage. *European Journal of Soil Biology* 95: 103121.

Loaiza, V., Pereira, E., Huang P, van der Heijden, M., Wittwer, R., Six, J. (2019) Soil microhabitats mediate microbial response in organic reduced tillage cropping. *Applied Soil Ecology* 137: 39-48.

Manzanares, C.; Yates, S.; Ruckle, M. Nay, M.; Studer, B. (2016) TILLING in forage grasses for gene discovery and breeding improvement. *New Biotechnology* 33(5): 595-601.

Matsuda, I., Sha, J.C.M., Ortmann, S., Schwarm, A., Grandl, F., Caton, J., Jens, W., Kreuzer, M., Marlina, D., Hagen, K.B., Clauss, M. (2015) Excretion patterns of solute and different-sized particle passage markers in foregut-fermenting proboscis monkey (*Nasalis larvatus*) do not indicate an adaptation for rumination. *Physiology and Behavior* 149:45-52.

Mueller, S.; Kreuzer, M.; Siegrist, M.; Mannale, K.; Messikommer, R. E.; Gangnat, I. D. M. (2018) Carcass and meat quality of dual-purpose chickens (Lohmann Dual, Belgian Malines, Schweizerhuhn) in comparison to broiler and layer chicken types. *Poultry Science* 97: 3325–3336.

Mutuli, G. P.; Mbugu, D. O. (2018) Effect of drying on the nutritional and organoleptic characteristics of African leafy vegetables, Jute Mallow (*Corchorus olitorius* L.) and Cowpea (*Vigna unguiculata*). *Journal of Biosystems Engineering* 43: 211-218.

Nay, M.M.; Byrne, S.; Pérez, E.; Walter, A.; Studer, B. (2020) Genetic characterization of buckwheat accessions through genome-wide allele frequency fingerprints. *Folia Biologica et Geologica* 61:5-11

Nesper, M., Kueffer, C., Krishnan, S., Kushalappa, C.G., Ghazoul, J. (2017) Shade tree diversity enhances coffee production and quality in agroforestry systems in the Western Ghats. *Agriculture Ecosystems & Environment* 247: 172-181.

Nesper, M.; Kueffer, C.; Krishnan, S.; Kushalappa, C. G.; Ghazoul, J. (2018) Simplification of shade tree diversity reduces nutrient cycling resilience in coffee agroforestry. *Journal of Applied Ecology* 56: 119-131.

Ramonedá, J.; Le Roux, J.; Frossard, E.; Bester, C.; Oetlé, N.; Frey, B.; Gamper, H. (2019) Insights from invasion ecology: Can consideration of eco-evolutionary experience promote benefits from root mutualisms in plant production? *AoB Plants* 11(6):plz060.

Ramonedá, J. Le Roux, J.J.; Frossard, E.; Frey, B.; Gamper, H.A. (2020) Geographical patterns of root nodule bacterial diversity in cultivated and wild populations of a woody legume crop. *FEMS Microbiology Ecology* 10: fiae145.

Ramonedá, J. Le Roux, J.J.; Frossard, E.; Frey, B.; Gamper, H.A. (2020) Experimental assembly reveals ecological drift as a major driver of root nodule bacterial diversity in a woody legume crop. *FEMS Microbiology Ecology* 6: fiae083.

Ruckle, M. E.; Bernasconi, L.; Kölliker, R.; Zeeman, S. C.; Studer, B. (2018) Genetic diversity of diurnal carbohydrate accumulation in white clover (*Trifolium repens* L.). *Agronomy* 8: 47.

Ruckle, M. E.; Bernasconi, L.; Kölliker, R.; Zeeman, S. C.; Studer, B. (2018) Genetic Diversity of Diurnal Carbohydrate Accumulation in White Clover (*Trifolium repens* L.). *Agronomy* 8(4): 2073-4395.

Ruckle, M.E.; Meier, M. A.; Frey, L.; Eicke, S.; Kölliker, R.; Zeeman, S. C.; Studer, B. (2017) Diurnal leaf starch content: An orphan trait in forage legumes. *Agronomy* 7: 6.

Schweizer, S. A.; Seitz, B.; van der Heijden, M.; Schulin, R.; Tandy, S. (2018) Impact of organic and conventional farming systems on wheat grain uptake and soil bioavailability of zinc and cadmium. *Science of the Total Environment* 639:608-616.

van 't Hag, L.; Danthe, J.; Handschin, S.; Mutuli, G.P.; Mbugu, D.; Mezzenga, R. (2020) Drying of African leafy vegetables for their effective preservation: Difference in sorption isotherms and nutrition explained by their microstructure. *Food&Function* 11:955-964.

Vanlierde, A., Vanrobays, M.-L., Dehareng, F., Froimont, E., Soyeyrt, H., McParland, S., Lewis, E., Deighton, M.H., Grandl, F., Kreuzer, M., Gredler, B., Dardenne, P., Gengler, N. (2015) Hot topic: Innovative lactation-stage-dependent prediction of methane emissions from milk mid-infrared spectra. *Journal of Dairy Science* 98(8): 5740-5747.

Wiederkehr Guerra, G.; Jansen, M.; Huayllapuma, J.; Guariguata, M.; Kettle, C. (2019) Brazil nut tree pollinator communities and visitation frequency in Madre de Dios, Peru. In preparation.

Wille, L.; Messmer, M. M.; Studer, B., Hohmann, P. (2018) Insights to plant-microbe interactions provide opportunities to improve resistance breeding against soil-borne pathogens in grain legumes. *Plant Cell Environment* 42: 20-40.

Wille, L., Messmer, M., Bodenhausen, N., Studer, B., and Hohmann, P. (2020) Heritable variation in pea for resistance against a root rot complex and its characterisation by amplicon sequencing. *Frontiers in Plant Science*: doi: 10.3389/fpls.2020.542153

Wittwer, R. A.; Dorn, B.; Jossi, W.; van der Heijden, M. G. A. (2017) Cover crops support ecological intensification of arable cropping systems. *Scientific Reports*, 7: 41911.

Wu, W.; Beretta, C.; Cronje, P.; Hellweg, S.; Defraeye, T. (2019) Environmental trade-offs in fresh-fruit cold chains by combining virtual cold chains with life cycle assessment, *Applied Energy* 254: 113586.

Wu, W.; Cronje, P.; Nicolai, B.; Verboven, P.; Opara, U. L.; Defraeye, T. (2018) Virtual cold chain method to model the postharvest temperature history and quality evolution of fresh fruit – A case study for citrus fruit packed in a single carton. *Computers and Electronics in Agriculture* 144: 199-208.

Wu, W.; Cronje, P.; Verboven, P.; Defraeye, T. (2019) Unveiling how ventilated packaging design and cold chain scenarios affect the cooling kinetics and fruit quality for each single citrus fruit in an entire pallet, *Food Packaging and Shelf Life* 21: 100369.

Zellweger, H.; Feichtinger, G.; Pérez, E.; Walter, A.; Hund, A. (2017) Unkrautbekämpfung beim Buchweizen: Vergleich von fünf ausgewählten Herbiziden. *Agrarforschung Schweiz* 8 (7–8): 310-317.

Appendix

Public and Specialist Events Organized by WFSC and Partners 2016–2020

Event	Date	Location	Participants	Speakers	Organizers
Public lecture: sustainable proteins of the future	Mar 2016	ETH Zurich	100	Alexander Mathys, Béatrice Conde-Petit, Matthew Robin, Urs Fanger	WFSC
Workshop "To meat or not to meat"	May 2016	Schauspielhaus Basel	40	Isabelle Gangnat, Florian Grandl, Manuel Schneider, Mike Ruckle, Valeria Galetti	WFSC & eco. naturkongress
Public lecture: Beyond organic: diversification in food systems	Oct 2016	ETH Zurich	100	Emile Frison, Nina Buchmann	WFSC
World Food System Center Research Symposium	Nov 2016	ETH Zurich	200	Florian Grandl, Maike Nesper, Benjamin Costerousse and Roman Grüter, Eduardo Pérez, Anja Gramlich, Anna Greppi	WFSC
Workshop: Innovations for building resilience in food systems	May 2017	ETH Zurich	50	Michelle Grant, Johan Six, Benhard Lehmann, Dominique Barjolle, Benjamin Gräub	WFSC
Workshop: Challenges of digitalization in the AgroFood sector	May 2017	ETH Zurich	50	Achim Walter, Eduardo Pérez, Peter Braun,	Prof. Achim Walter, Swiss Food Research, WFSC
Public Lecture: Weather shocks over food producing regions in developing countries significantly affect asyllum applications to the European Union	July 2017	ETH Zurich	30	Wolfram Schlenker	Prof. Robert Finger, WFSC
Public screening and panel discussion: Food evolution documentary	July 2017	ETH Zurich	100	Wilhelm Gruissem, Susanne Ulbrich, Markus Hardegger	WFSC
Exhibit at ETH Zurich and University of Zurich Science Days (Scientifica)	Sep 2017	University of Zurich	300	ETH Zurich Crop Science & Sustainable Agroecosystems Groups, PubliFarm	ETHZ & UZH, WFSC
Workshop: Animal feed production from biowastes: a roadmap for research on insect based feed	Sep 2017	Stellenbosch, South Africa	27	Alexander Mathys, Stefan Diener, Jibin Zhang, Elsje Pieterse	WFSC, Stellenbosch University, Food Security Initiative
Public lecture: Tackling malnutrition with biofortification	Sep 2017	ETH Zurich	70	Maria Isabel Andrade, Michelle Grant, Engil Isadora Pujol Pereira, Diego Moretti	WFSC
PublicFarm exhibit at OLMA 2017	Oct 2017	St. Gallen	-	Anna Katarina Gilgen, Anett Hofmann	PublicFarm, WFSC
World Food System Center Research Symposium	Nov 2017	ETH Zurich	272	Charlotte Decock, Wentao Wu, Isabelle Gangnat, Mike Ruckle, Viviana Loaiza, Tobias Zehnder, Alexander Mathys, Eduardo Pérez, Jonas Joerin	WFSC
Public lecture: Fraud in organic food	Apr 2018	ETH Zurich	100	Chris Elliott, Hans Ramseler, Patrik Aebi, Martijn Sonneveld	WFSC
Smart farming - Was heisst das für die Schweiz	June 2018	ETH Zurich	250	Bundesrat Johann Schneider-Ammann, Lino Guzzella, Achim Walter	ETHZ, Prof. Achim Walter, WFSC
Symposium: Managing risk in agriculture	July 2018	ETH Zurich	150	Hans Feyen, Yann de Mey, Joshua Woodard, Robert Finger	Prof. Robert Finger, ETH Risk Center, WFSC
Seminar: A tale of the black soldier fly - harnessing the decomposition process to produce food and feed	Sep 2018	ETH Zurich	80	Jeffery Tomberlin	Prof. Alexander Mathys, WFSC
Workshop: Tools and innovations needed to build resilience of farmers and territories at forum origin, diversity and territories	Oct 2018	Torino, Italy	30	Martijn Sonneveld, Dominique Barjolle	Forum Origin, Diversity and Territories, WFSC
ETH Zurich exhibit at OLMA 2018	Oct 2018	St. Gallen	16'000	Various ETH Researchers	ETHZ, PSC, WFSC

Event	Date	Location	Participants	Speakers	Organizers
World Food System Center Research Symposium	Nov 2018	ETH Zurich	300	Miichael Siegrist, Martijn Sonneveld, Olivia van der Reijden, Markus Schuppler, Leonie van't Hag, Chris Kettle, Michelle Grant, Jonna Cohen	WFSC
Film screening: In our hands: seeds of change	Nov 2018	ETH Zurich	80	Martijn Sonneveld, Linn Borgen Nilsen, Christian Schöb, Lukas Peter	NADEL, WFSC
Kantonsschule Stadelhofen in Zurich excursion to the World Food System Center	Dec 2018	ETH Zurich	20	Anna K. Gilgen, Lukas Wille, Maike Heuel	WFSC
Public event: Pesticides- what does science say?	Apr 2019	ETH Zurich	110	Michelle Grant, Robert Finger, Lothar Aicher, Philipp Staudacher	WFSC
AgriTech day: Agriculture of the future – digital and sustainable?	May 2019	ETH-Research Station for Plant Sciences, Strickhof, AgroVet-Strickhof	1000	Various ETH Researchers	WFSC, Strickhof, AgroVet-Strickhof
Exhibit at ETH Zurich and University of Zurich Science Days (Scientifica)	Aug 2019	ETH Zurich	500	ETH Zurich Crop Science & Food Immunology groups, WFSC	ETHZ & UZH, WFSC
Seminar: Implications of Digitalisation in Agriculture	Sep 2019	ETH Zurich	120	Sjaak Wolfert, Krijn Poppe, Áine Regan	Prof. Robert Finger, WFSC
World Food System Center Research Symposium	Oct 2019	ETH Zurich	240	Detlef Günther, Leandro Buchmann, Anna Greppi, Rafaela Feola Conz, Josep Ramoneda, Ben Wilde	WFSC
Climate change and nutrition – Burger game at the Kantonsschule Stadelhofen	Dec 2019	Zurich	16	Braida Thom, Lina Urio	Kantonsschule Stadelhofen, WFSC
Pathways for Advancing Pesticide Policies Webinar	Oct 2020	Webinar	185	Robert Finger, Per Kudsk, Nikolas Möhring, Karin Ingold, Bruno Studer	WFSC, Agricultural Economics and Policy Group
Changing the food system, one meal at a time	Nov 2020	Webinar	280	Michelle Grant, Linn Borgen Nilsen, Akanksha Singh, Susanne Tobler	WFSC & NADEL
World Food System Center Research Symposium: Plant Breeding for Global Food Security Webinar	Dec 2020	Webinar	142	Lukas Wille, Beat Keller, Monika Messme, Bruno Studer, Clare Mugisha Mukankusi, Robert Santiago Andrade, and Martijn Sonneveld	WFSC
World Food System Center Research Symposium: Poster Session and Networking Event	Dec 2020	Webinar	95	15 research presentations in 5 moderated themed-rooms	WFSC
Total			21'037		

Appendix

Finances 2016–2020

Summary of Consolidated Financials
(Infrastructure and Program)

Income	2016	2017	2018	2019	2020	Total
ETH Zurich Infrastructure Funding	250'000	250'000	250'000	250'000	250'000	1'025'000
Member Fees	66'000	70'000	62'000	64'000	70'000	332'000
Management Support Funding from ETH Sources	110'000	192'050	150'000	154'260	241'000	847'310
Management Support Funding from Third Party Sources	66'026	79'000	90'000	287'990	43'500	566'516
Donations through ETH Foundation	2'202'977	1'769'187	894'649	1'430'993	694'500	6'992'306
WFS Fonds (former "Fonds Agroalimentaire")	19'500	-	7'082	20'000	20'000	66'582
Miscellaneous	5'206	-	-	200	750	6'156
Total Income	2'719'709	2'360'237	1'453'731	2'207'443	1'319'750	10'060'870
Expenses						
Programs and Projects						
Research	2'105'902	1'640'436	844,649	1'357'993	608'000	6'556'980
Education	59'946	16'359	5'722	47'889	43'955	173'871
Outreach	49'453	51'744	12'718	65'916	90'866	270'697
Management and Infrastructure						
Personnel (including social benefits)	420'014	419'145	469'825	596'923	483'213	2'389'120
Office and Administration	9'983	8'866	14'079	9'773	11'825	54'526
Travel	8'304	3'653	4'138	1'761	417	18'273
Communications	3'149	758	554	2'067	1'303	7'831
Miscellaneous	6'953	7'083	4'303	3'039	1'877	23'255
Total Expenses	2'663'704	2'148'044	1'355'988	2'085'362	1'241'455	9'494'553

Special Thanks to Phase II Chair and Steering Committee



Michael Siegrist was Chair of the World Food System Center from July 2017 until January 2021. We thank him for his dedication to the Center and bringing his passion for issues concerning consumers to our discussions. We look forward to continued work with him and his group as members.

We also thank a number of members that served on the Steering Committee throughout Phase II, and now step back from the roll while remaining active members of the Center.

Nina Buchmann, also Chair until June 2017
Emmanuel Frossard
Bruce McDonald
Laura Nyström

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ETH Zurich, April 2021