

World Food System Center Annual Report 2019





Michael Siegrist and Martijn Sonneveld

DEAR COLLEAGUES, PARTNERS, ALUMNI, AND FRIENDS,

In these difficult times, we look with great concern on the rapid spread of the COVID-19 virus. At the moment, we can only guess what effects the present crisis will have on the world and its food system. At the same time, we look back with joy and gratitude on the year that has past. In different news items, reports, films, activities, and events, we addressed important issues of the food system and discussed possible solutions.

In April, we organized a public event to support the ongoing discussions about pesticide use in agricultural production with perspectives from scientists working in various fields. The experts shared their different viewpoints on a panel and by directing discussing questions with participants in an informal setting.

New technologies and digitization are not only changing the way we communicate and work but also the way we produce food. So-called 'smart farming' has the potential to make agricultural production more efficient, accelerate breeding progress, reduce emissions, and conserve natural resources. At AgriTech Day in May, researchers from ETH Zurich, Strickhof, and AgroVet-Strickhof came together to put on an innovative public event to share and discuss the potential and challenges of smart farming. Numerous attractions allowed for discovery, exchange, and a bit of fun for all ages.

Together with partners, we want to stimulate new research and education projects. This is why we are happy to further strengthen and expand the research cooperation between EPFL, ETH Zurich, and our Swiss industrial partners through the Future Food Initiative. The initiative supports young talents by funding their postdoctoral projects targeting future food issues such as nutrition, production, packaging, and digital health.

All of our events, activities, and educational offerings aim to highlight, discuss, and disseminate current topics and results from research conducted in our 44 member groups. In these challenging times, when direct interactions are often not possible, we want to stimulate a fact-based discussion on important and pressing issues of the global food system. We therefore plan to share stories about how the COVID-19 pandemic is affecting food systems and food and nutrition security worldwide. We will use our multiple social media platforms to share. Please feel free to comment, share, and contribute to these discussions.

Together for a sustainable food system.

Michael Siegrist
Chair

Martijn Sonneveld
Executive Director

To assess different agroforestry practices in Ghana and Ivory Coast, researchers of the DAFS project discuss with local farmers.

Cover Image: ArtScience exhibit at WFSC Research Symposium 2019.

YEAR IN REVIEW

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



Keynote “What will we eat tomorrow?” in Schaffhausen



Stories of Tef: A film series released



WFSC Research Programs support 3 new projects



Helvetas Switzerland webinar “Coherent Policies Driving Sustainable Food Systems”



AgriTech Day: Agriculture of the Future – digital and sustainable?



ETH Zurich podcast “Insects on our Plates”



ETHZ/UZH Scientifica




Seminar “Implications of Digitalisation in Agriculture”



Diplomatic Courier article “Investing in Sustainable Food Systems”



ETH GLOBE magazine focuses on WFSC research



Panel Discussion “The Future of Food- The Science of Your Synthetic Supper” at Hiltl Akademie

JANUARY

Future Food Initiative launched and 4 fellows selected



FEBRUARY

5 videos highlighting WFSC projects launched



MARCH

Public Event: Pesticides - What Does Science Say?



APRIL

Hémisphères ArtSci exhibition at D-USYS



MAY

CNS-FAO Keynote on Agroecology at FAO in Rome



JUNE

Learning and Exchange Visit for Assam Agricultural University students



JULY

Edible Research receives Simulation Game Award



AUGUST

Planspiel Palmöl Sekundarstufe I und II Handreichung für Lehrpersonen



SEPTEMBER

WFS Summer School “Food Systems in Transition” in Switzerland



OCTOBER

Michelle Grant wins Australian Advance Award for Food & Agriculture



NOVEMBER

Uplift magazine features World Food System Initiative



DECEMBER

Swiss Forum for International Agricultural Research awards





beacons of hope



Exhibit at OLMA Swiss Fair for Agriculture and Food



ArtScience exhibit at WFSC Research Symposium



Call of the Future Food Initiative opens



We believe a broader adoption of a food systems approach allows building resilient food systems capable of providing food and nutrition security.

THE CENTER

In the coming decades, our 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) 2030 Agenda for Sustainable Development and its Sustainable Development Goals. 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. Only if all equally play their part, can shared solutions to the world's urgent challenges be realized. 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 world-wide 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, we will fall far short of achieving the ambitious SDGs.

In order to play a leading role in addressing such challenges, ETH Zurich established the World Food System Center (WFSC) in 2011. At the WFSC, 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

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.

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. Therefore, the WFSC 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 Center is based on the understanding that solutions to food system challenges require collaboration from stakeholders across the entire food value chain. Center programs 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 core values dictate the (1) importance of academic independence and include a commitment to (2) sustainability, (3) transparency, (4) objectivity, (5) inter- and trans-disciplinarity, (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 2019 comprised 44 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 ten elected members and led by a Chair, oversees the strategy and operational functions carried out by the Executive Office.

The Scientific Advisory Board of six external advisors provides strategic advice to the Steering Committee and connections to key external organizations. The Partnership Council is formed by foundations and industry partners who make substantial donations to the programs of the Center through the ETH Zurich Foundation.



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.

NEW MEMBERS



Prof. Sebastian Dötterl leads the group of Soil Resources in the Department of Environmental Systems Science.

«Climate change, population growth, and unsustainable land use degrade soils and ecosystems at an unprecedented rate and are the big challenges to sustain soil as a vital resource for the food supply of future generations. Isolated research projects will not lead to the rapid implementation into agronomic and land management policies that is needed to avoid the destabilization of entire nations, especially in the global south. WFSC is an essential platform at ETH to encourage the interdisciplinary research needed to provide perspectives and solutions for policy makers and stakeholders addressing these issues.»

Prof. Rachael Garrett heads the group of Environmental Policy in the Department of Environmental Systems Science.

«I joined the WFSC to connect with other ETH community members who are interested in addressing the grand sustainability challenges that both influence and are influenced by the global food system. The WFSC brings together an impressive array of researchers to tackle these challenges and is extremely effective in connecting that research to students and the public through various media and events. I feel very lucky to be working at an institution with such a strong food system program.»



Prof. Thomas van Boeckel leads the group of Health and Geography Policy in the Department of Environmental Systems Science.

«The WFSC is the foremost platform at ETH to bridge the gap between scholars and industry on food related issues. In this capacity it provides a great opportunity for collaborations to those working on antimicrobial resistance, a growing problem in food production.»

Dr. Jan Dirk Wegner heads the EcoVision Lab in the Department of Civil, Environmental and Geomatic Engineering.

«I believe that the WFSC is a great platform for cross-disciplinary research in the food sector. With the computer science approach to research in this field, we hope to offer original solutions especially through development of modern deep learning methods in collaboration with our colleagues in food science.»



Prof. Emma Wetter Slack leads the Laboratory for Food Immunology in the Department of Health Sciences and Technology.

«Better disease prophylaxis in food-producing animals is crucial both in the fight against antimicrobial resistance and in improving animal welfare and productivity worldwide. The multidisciplinary environment of the WFSC puts us in contact with the full spectrum of expertise and collaborators needed to really make a difference in this area.»



Prof. Christian Wolfrum heads the Laboratory of Translational Nutrition Biology in the Department of Health Sciences and Technology.

«Given the continuous increase in obesity rates worldwide, which as consequence leads to a host of chronic diseases, novel nutritional interventions will be required to complement and support pharmacological treatment strategies. The multidisciplinary environment of the WFSC allow us to interface with many different experts in this area to tackle this multi-disciplinary problem.»



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, in addition, 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. 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. 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 working together with stakeholders in a way that creates added value for both organizations without engaging in a permanent relationship involving binding commitments.



Beatrice Conde-Petit of Bühler Group interacting with participants at the 2019 WFSC Research Symposium.



We enable novel interdisciplinary research that contributes knowledge and solutions to key food system challenges.

RESEARCH

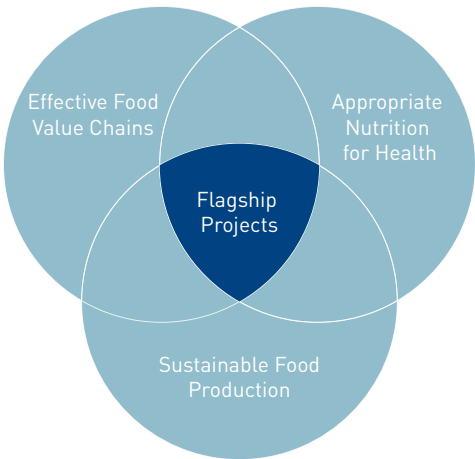
The global population is expected to reach nearly 10 billion people by 2050. How will we provide adequate nutrition for 10 billion within the bounds of our planet? The United Nations 2030 Agenda for Sustainable Development commits the international community to act together to meet such challenges and 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 projects, and engaging in special collaborations.

THEMATIC RESEARCH
FOCUS AREAS

The WFSC adopts a systems perspective to its research that takes place within interlinked thematic 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.



WFSC Thematic Research Focus Areas.

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.

The program is structured around annual calls for proposals for research projects at the postdoctoral level. The fellowship provides personal research funds for three years that enable fellows to work on their projects in a research laboratory with a host professor at ETH Zurich or EPFL. The first call for the program was held in Spring 2019, and four fellowships were awarded. The second call for fellowships opened in December 2019. Learn more about the program at <https://www.futurefoodtalents.org>.

RESEARCH PROGRAMS

The Center’s Research Programs support new cross-disciplinary 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.

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 continuing projects. Learn more about all the projects at <http://www.worldfoodsystem.ethz.ch/research>.



Researcher Josep Ramoneda in South Africa.

PROJECT UPDATE

Limited access to land and ongoing desertification threaten the sustainability of organic rooibos tea production in South Africa. The project “Ecological intensification of organic rooibos cultivation in South Africa” ([EcolInt](#)), explores the potential of microbial root symbioses to assist rooibos nutrition and growth. By uncovering the large diversity of beneficial microbes present in rooibos roots, low-cost management practices to sustain rural livelihoods can be identified.

The project determined the dominant root symbioses of rooibos, showing that locally available sheep dung promotes symbiotic microbial diversity when applied to rooibos seedling nurseries. Local research revealed that soils from surrounding wild rooibos populations can be incorporated in the nurseries to trigger new mutualistic interactions previously missing in the plantations. Finally, particular nitrogen-fixing bacteria that positively correlate with improved rooibos nutrition and growth were identified. The project has raised awareness that beneficial plant-microbe interactions are often compromised in modern crops by publishing a review article on the topic in the journal *Annals of Botany Plants*.

PROJECT UPDATE

Irrigation modernization, such as shifting from flood irrigation to drip irrigation, as a measure to move towards a sustainable use of freshwater resources in agricultural areas is highly debated. The project “Understanding the effects of irrigation modernization in water resources management – citrus production in the Jucar river basin, Spain” ([IRRIWAM](#)) aims to quantify the multi-temporal effects of a gradual transition from flood to drip irrigation on groundwater recharge from farm level to basin scale.

The interdisciplinary project team applied a bottom-up approach, informed by experimental knowledge and stakeholder information, to develop a numerical agro-hydrological modelling procedure suitable for the simulation of different irrigation practices. They found that the effect of irrigation modernization on groundwater recharge is governed by the temporally dynamic interplay between irrigation practice, soil moisture conditions, and the occurrence of short and intense precipitation events. The relevance and scientific novelty of the project has been recognized with an award from the Swiss Hydrological and Limnological Society.



Irrigated citrus plantation in Valencia.

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 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. In addition, the WFSC supports project teams by providing the Center’s expertise in education and outreach. Examples of such engagements include being an education and outreach partner in the international consortium project “Delivering Food Security on Limited Land.” The project is funded by the Belmont Forum and FACCE-JPI initiative, with WFSC member Prof. Nina Buchmann as co-Principal Investigator. In 2019, the World Food System Summer School was organized in partnership with the consortium.

In 2019, the Center also started providing outreach services to the ongoing EIT Food Grand Challenge Innovation Project “3TexVegs+H.” For this project that is focused on new protein alternatives, the Center helps to develop and implement a targeted outreach strategy.

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 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), and academic partners.

Highlights from 2019 include the kick-start of the Swiss Agency for Development and Cooperation **RUNRES project** (Rural-Urban Nexus: Establishing a nutrient loop to improve city region food system resilience). In the Democratic Republic of Congo, Ethiopia, Rwanda, and South Africa, different stakeholders from crop producers to waste processors came together several times to discuss possible innovations to build a circular economy. In addition, the project **OrRes** completed a resilience assessment of organic and conventional smallholder banana producers in the Dominican Republic to flooding caused by hurricanes. Further, a systemic approach to tomato farmers’ resilience in the face of droughts and market variability was conducted in Morocco and Ghana. Other projects continue worldwide.



RUNRES workshop participants in the Democratic Republic of Congo.



Principal Investigator Prof. Achim Walter giving a tour at AgriTech Day.

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 2019 was the organization of AgriTech Day in May. The innovative public event saw the ETH-Research Station for Plant Sciences, Strickhof and AgroVet-Strickhof open their doors under the motto “Agriculture of the future - digital and sustainable?” At numerous attractions, demonstrations and forums discussions, visitors discovered innovative tools to support more sustainable Swiss agriculture. The public of over 1000 visitors also added their thoughts to the discussions in the forum, which hosted five researchers from ETH Zurich and a panel discussion, throughout the day.

In addition, the ETH Zurich course “Innovation in Precision Agriculture” was successfully run for the second time in fall 2019. A collaboration of the Crop Science group of Prof. Achim Walter with the Chair of Entrepreneurship and the Student Project House, the course allowed students to interact with experts from the sector and to develop and prototype solutions to a challenge of their choice.

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.

The various subprojects continue to produce food processing innovations. Recent publications include a study focusing on extruded meat analogues based on yellow microalgae, which shows the enhanced nutritional value as a result of microalgae incorporation into a soy-based protein product. Another explores increasing the performance of biowaste treatment with black soldier fly larvae, with the ultimate goal of larvae to be used as feed.

The EU Horizon 2020 project **SUStainable INsect CHAIN** started in 2019 with a focus on novel protein provision from insects for feed and food in Europe. Prof. Mathys is a collaborator, and doctoral student Daniela A. Peguero has joined ETH Zurich to work on the project.

The innovations of the Flagship project have also been highlighted in Swiss media, including an **ETH Zurich Podcast** focused on the consumer and sustainability dimensions of introducing insects into European diets and the SRF radio program **Espresso**, focusing on microalgae as a promising source of protein.



ETH Zurich Podcast featuring Prof. Alexander Mathys and Dr. Christina Hartmann.



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

EDUCATION

The 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.

SUMMER SCHOOLS AND
LEARNING VISITS

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 on food systems.

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.

Find out more about the Center’s summer schools on our website: <http://www.worldfoodsystem.ethz.ch/education/summer-schools>.

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 K. Gilgen, and Nina Buchmann in the journal *Sustainability*. The paper explores the use of the rich picture method as a simple tool for reflective teaching and learning about sustainable food systems. The research is based on the use of an adapted rich picture method over the last three years of running the World Food System Summer School in different locations around the world. The paper specifically looks at the efficacy of the tool to identify the knowledge gained by participants as the result of the course; the results shows the method is a very useful and can be applied in a wide range of sustainability or complex systems education.

Exchange and Learning Visit. Over ten days in June 2019, the WFSC hosted twenty 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 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.



Students from Assam Agricultural University visiting a cheesemaker in the Swiss Alps.

SUMMER SCHOOL 2019

How can we make food systems more sustainable? What is our role in creating change? These were the fundamental questions during the WFS Summer School 2019 taking place in Rheinau, Switzerland from 17 August to 01 September. The course brought together 24 participants from 18 different countries to explore sustainable food systems through an interactive and engaging learning program.

The first 10 days of the course were key for the participants to gather a more in-depth understanding of world food systems. Numerous topics were navigated through diverse and interactive sessions, including nutrition and health, the role of retailers and consumers, policy and trade, alpine farming, systems thinking and mapping, agriculture, the drivers of climate change and biodiversity loss, agroecology, and the importance of soil and organic seed production.

The students then 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.

Testimonials from students:

«The course helped me to find myself in this topic, understand the complexity and the huge number of opportunities waiting outside for me to get engaged.»

“This course provided by the WFSC is an excellent course and by far one of the best I have participated in. The content is diverse and the participants are also diverse in not only where they come from but their area of expertise. The course is intense and challenges your understanding of the food system and allows for sufficient personal reflection on your values, beliefs, and personal goals and contributions to a more sustainable food system.»

This course was organized in partnership with the Delivering Food Security on Limited Land research consortium, coordinated through the Belmont Forum and the FACCE-JPI Initiative. Additional financial support comes from Mercator Foundation Switzerland.



Students on a tour of the organic farm of Gut Rheinau.



Visiting local producers in the Swiss Alps.



Students working in teams on real-world regional food network case studies.

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 2014, the Center has collaborated with the Sustainable Agroecosystems Group to offer a three-day course for ETH Zurich Master's students at the Food and Agriculture Organization of the United Nations (FAO) headquarters in Rome. The goal of the course is to learn about different food security topics from the perspective of FAO officers and observe the functioning of a large international institution such as the FAO. The yearly focus of the course modulates in order to incorporate timely food security topics.

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



ETH Zurich students at the FAO in Rome.

WFSC ALUMNI NETWORK

Through the Center's educational activities, we create and coordinate a growing interdisciplinary and global community of alumni. In 2019, this WFSC alumni network (WFSCAN) boasted 213 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. In September 2019, the website www.wfscalumni.com launched.



Activity exploring career paths during the WFS Summer School session "How do we create change."

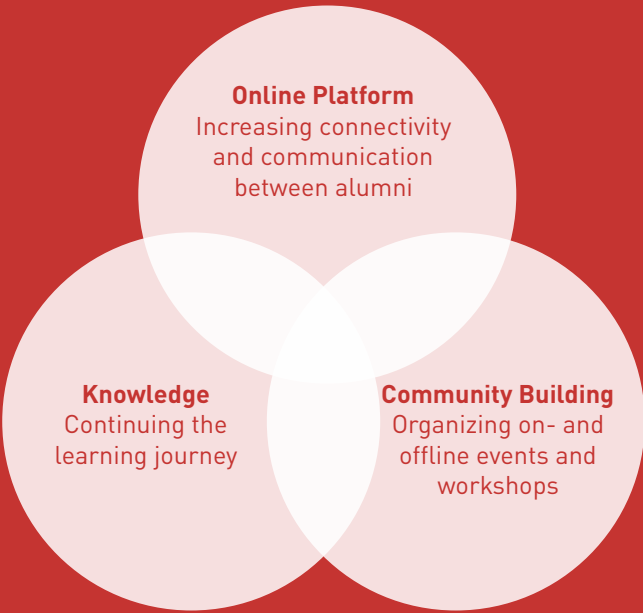
ALUMNI NETWORK DEVELOPMENT

The vision of the WFSC is to cultivate a collaborative alumni network that inspires and leads change towards sustainable food systems, with the mission to support alumni-driven initiatives that foster connecting, learning, and contributing.

In August 2019, this network was formalized as a platform for alumni, by alumni, with three new board members: Nora Bartolomé Gutiérrez as Community Coordinator, Milena Wiget as Knowledge and Exchange Coordinator, and Viviana Loaiza as Platform Coordinator.

The new board moved forward with establishing the organization, setting up an online platform accessible to alumni upon registration (www.wfscalumni.com), and coordinating learning and exchange activities both on- and offline. The website contains features such as a member database; the possibility to share articles, events, and job opportunities; and organization of 'knowledge seasons' on specific topics.

The first 'knowledge season' was then launched, focusing on seed sovereignty. The inaugural activity organized by the new board took place in November 2019 at the Naturkraftwerke, an innovative Swiss organic producer and processor. The group learned what one can cook with a range of grain varieties and shared their experience with alumni across the world [via video](#). The board plans on many more events throughout 2020.



Focus areas of the alumni network.



The WFSCAN board: Viviana, Milena, and Nora



Alumni cooking at the Naturkraftwerke event.



Alumni and WFSC staff at the Naturkraftwerke.



We engage with a broad audience to increase awareness about challenges in the world food system and approaches to creating solutions.

OUTREACH

The Center 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. We reach a wide range of interested stakeholders in Switzerland and abroad through diverse outreach activities, ranging from public events and lectures, exhibitions and guided tours, webinars, and direct discussions. The outreach activities make locally visible how our members and the ETH Zurich community more broadly contribute to global food challenges.

PUBLIC AND SPECIALIST EVENTS

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. Through public events, we aim to make contemporary food system research accessible to a wider audience. In 2019, we hosted a salon discussion focusing on pesticide use in agriculture with researchers from various Swiss research institutions. We also organized our fourth 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 2019 included AgriTech Day, an innovative event focusing on sustainable smart farming and the symposium “Implications of Digitalisation in Agriculture,” together with the Agricultural Economic and Policy group of Prof. Robert Finger.

Scientifica. The Center organized a public exhibit at the ETH/UZH Scientifica “Science Days” in September 2019. During the three day event, the interactive exhibit “Food of the Future” featured researchers from the Crop Science Group (Prof. Achim Walter) and the Laboratory for Food Immunology (Prof. Emma Wetter Slack), who are developing innovative solutions to create more sustainable agricultural and food systems.



Emma Wetter Slack and Daniel Burga ready to play Pig Pong with Scientifica visitors, introducing their innovative work on vaccines for livestock.

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 directly 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. The Center’s social media presence has grown to include several platforms:

- @ethzwfsc
- @ethzwfsc
- World Food System Center
- World Food System Center ETH Zurich

RESEARCH SYMPOSIUM 2019

The annual World Food System Center Research Symposium held in October 2019 highlighted the research that the Center’s Research Programs support as well other food system relevant research conducted by our member groups.

The symposium focused on how current research contributes to sustainable food systems and supports reaching the Sustainable Development Goals (SDGs) of the UN Agenda 2030. The main program started with a keynote address on the Future Food Initiative by Prof. Dr. Detlef Günther, ETH Zurich VP Research and Corporate Relations. The presentation sessions then featured inputs from five concluding research projects focused (1) Nutritious, Safe and Sustainable Food for All and (2) Healthy Soils, Improved Livelihoods: “New sustainable food formulations based on algae proteins (**NewAlgae**)” by Leandro Buchmann; “Application of *Lactobacillus reuteri* to naturally prevent *Campylobacter* colonization of chicken (**CampyChick**)” by Anna Greppi; “Towards nutritional security through organic management of soil fertility in orange-fleshed sweet potato systems in Mozambique (**ORMASPI**)” by Rafaela Feola Conz; “Microbial services for an environmentally and economically sustainable rooibos tea production (**EcoInt**)” by Josep Ramoneda; “Nitrified urine fertilizer: A transdisciplinary approach to solutions-oriented community development (**NUFSOC**)” by Ben Wilde.

The audience then interacted with researchers at the networking poster session showcasing 50 posters on food system research and Center initiatives. We congratulate the winners of the poster prizes awarded at the symposium: Best Overall Poster Prize: Consumer’s knowledge gain through a cross-categorical environmental food label by Marius Dühr, Michael Siegrist, and Bernadette Sütterlin, and the Mercator Poster Prize: Why are there regional differences in the uptake of organic farming? by Marc Chautems, Robert Finger, and Robert Huber.

We thank all the presenters and contributors for making this networking event such an interesting and inspiring success.

To find the full proceedings of the event and many of the presented posters, visit our website: www.worldfoodsystem.ethz.ch/outreach-and-events/past-events/symposium-2019



Detlef Günther introducing global challenges to the audience.



Taking a moment to thank Anna K. Gilgen for her efforts at the Center.



Discussions during the networking poster session.



Michelle Grant asked the audience why they choose to eat a certain apple. What led to that decision?

PESTICIDES - WHAT DOES SCIENCE SAY?

In order 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 sent questions to our panel of experts and talked further with them and other invited scientists in an open discussion.

Michelle Grant moderated the evening, which started with the introduction of the panel: Robert Finger, professor of Agricultural Economics and Policy at ETH Zurich, Dr. Lothar Aicher, a regulatory toxicologist at the Swiss Center for Applied Human Toxicology, and Philipp Staudacher, a doctoral student at Eawag. Comments from the panelists were broad in range, from specific pesticide effects and how risk assessments are conducted to more system-based issues of how agricultural policy changes over time.

After the plenary session, all attending were encouraged to continue the discussion with the three panelists as well as with other invited researchers working on issues related to pesticide use in food systems. With a drink and a snack, the audience engaged in a lively discussion and learned more about different perspectives and trade-offs.

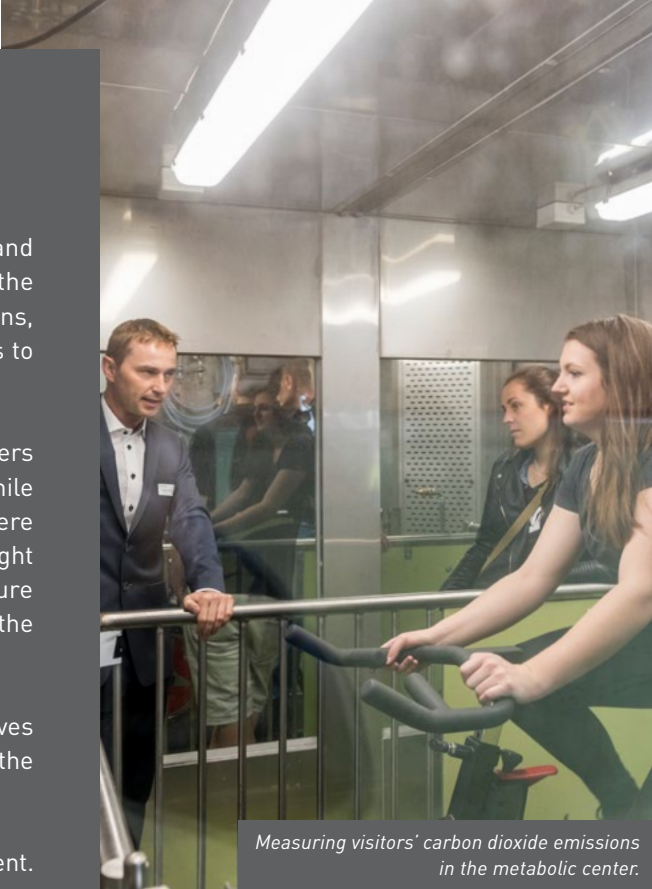
AGRITECH DAY

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 open discussion about smart farming among producers and consumers alike is important to achieve its potential for production and breeding while considering also economics and environmental issues. Such topics were discussed in the forum, where researchers from ETH Zurich shed some light on the different perspectives and challenges of digitalization. The lecture series ended with a panel discussion about sustainable agriculture from the perspectives of research, education, politics, and practice.

An important aspect of the day was the exchange of ideas and perspectives among all involved. The public added their thoughts to the discussions in the forum throughout the day.

We thank all those participated for making this a truly outstanding public event. We hope all that attended had an informative and inspiring day! To learn more about the event, visit www.ethz.ch/agritech



Measuring visitors' carbon dioxide emissions in the metabolic center.

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.

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 33 stories by the end of the 2019.

<http://www.foodsystemstories.org/>

REPRESENTATION AT CNS-FAO

WFSC Education Director Michelle Grant represented ETH Zurich in the Swiss National Committee of the UN FAO (CNS-FAO), a position nominated by the federal council, from 2016-2019.

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 final version was approved by the CNS-FAO committee and presented by Michelle at the FAO in Rome in 2019. WFSC Executive Director Martijn Sonneveld continues the representation of ETH Zurich, as the elected President of the CNS-FAO from January 2020.



Food System Story highlight: Katja Degonda and Severin Wiens researching dynamic agroforestry with cocoa in Côte d'Ivoire.

APPENDIX

MEMBERS

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

D-USYS



***PROF. NINA BUCHMANN**
Grassland Sciences



PROF. CONSUELO DE MORAES
Biodiversification and Entomology



PROF. SEBASTIAN DÖTTERL
Soil Resources



PROF. PETER EDWARDS
Singapore-ETH Centre



***PROF. EMMANUEL FROSSARD**
Plant Nutrition



PROF. JABOURY GHAZOUL
Ecosystem Management



PROF. RACHAEL GARRETT
Environmental Policy

D-USYS



PROF. HUBERT 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 PAUSCH
Animal Genomics



PROF. CHRISTIAN SCHOB
Agricultural Ecology


D-USYS



PROF. RAINER SCHULZ
Soil Protection



PROF. SONIA SENEVIRATNE
Land-Climate Dynamics



***PROF. JOHAN SIX**
Sustainable Agroeosystems



PROF. BRUNO STUDER
Molecular Plant Breeding



PROF. SUSANNE E. ULBRICH
Animal Physiology




PROF. THOMAS VAN BOECKEL
Health Geography and Policy



PROF. ACHIM WALTER
Crop Science

D-USYS



PROF. LENNY WINKEL
Agricultural Environmental Geochemistry



***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 NYSTRÖM**
Food Biochemistry

D-HEST



***PROF. MICHAEL SIEGRIST**
Consumer Behavior



PROF. SHANA STURLA
Toxicology



PROF. EMMA WETTER SLACK
Food Immunology




PROF. ERICH WINDHAB
Food Process Engineering



PROF. CHRISTIAN WOLFRUM
Translational Nutrition Biology



PROF. MICHAEL B. ZIMMERMANN
Human Nutrition



PROF. ISABEL GÜNTHER
Development Economics

D-BIOL



PROF. WILHELM GRUSSEM
Plant Biotechnology



***PROF. SAMUEL C. ZEEHAN**
Plant Biochemistry

D-ARCH



PROF. GERHARD SCHMITT
Information Architecture

D-BAUG




PROF. STEFANIE HELLWEG
Ecological Systems Design



DR. JAN DIRK WEGNER
Ecovision Lab

Empa



PROF. RENÉ ROSSI
Biomimetic Membranes and Textiles

Eawag



DR. CHRISTIAN STAMM
Environmental Chemistry

Eawag



PROF. HONG YANG
Water, Environment and Food Security



***DR. CHRISTIAN ZURBÜGG**
Water and Sanitation

APPENDIX

SCIENTIFIC ADVISORY BOARD

The Center’s SAB was formed in 2012 and meets in general 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 2019:

Dr. Martin Bloem
Director, Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health

Ian Johnson
Former Secretary General, Club of Rome

Prof. Dr. Bernard Lehmann
Former 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 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 2019:

Stiftung Mercator Schweiz

Bühler Group

Coop

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 Sonneveld
Executive Director

Michelle Grant
Education Director

Dr. Anna Katarina Gilgen
Project Manager
(left in 2019)

Dr. Eduardo Pérez
Project Manager ETH Studio
AgroFood (left in 2019)

Monika Piessens
Education Manager

Braida Thom
Project Manager
(joined in 2019)

Dr. Jeanne Tomaszewski
Communications Manager

Total full-time equivalents
(end 2019): 3.6

 **World Food System Center**

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APPENDIX

FINANCES

2019 ANNUAL REPORT

Summary of Consolidated Financials (Infrastructure and Program)

Income	
TOTAL INCOME	
ETH Zurich Infrastructure Funding	250'000
Member Fees	64'000
Management Support Funding from ETH Sources	154'260
Management Support Funding from Third Party Sources	287'990
Donations through ETH Foundation	1'430'993
Miscellaneous	200
Expenses	
TOTAL EXPENSES	
Programs and Projects	
- Research	1'357'993
- Education	47'889
- Outreach	65'916
Management and Infrastructure	
- Personnel (including social benefits)	596'923
- Office and Administration	9'773
- Travel	1'761
- Communications	2'067
- Miscellaneous	3'039

SELECTED PUBLICATIONS 2019

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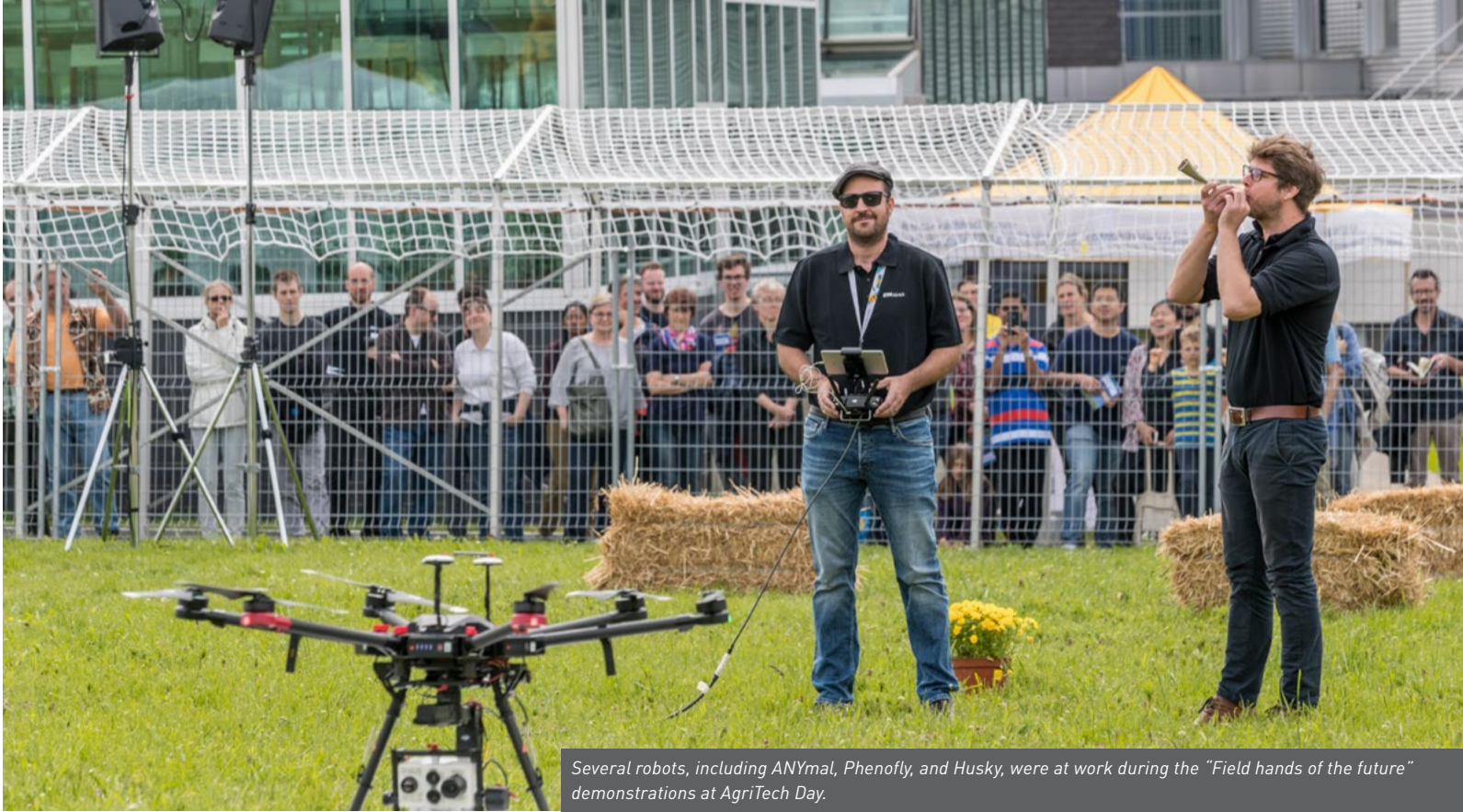
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Several robots, including ANYmal, Phenofly, and Husky, were at work during the “Field hands of the future” demonstrations at AgriTech Day.

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. Zimmermann, 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 Research 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 Research Program
Increasing genetic gain in climbing bean development (IncreBean)	2018 – 2020	Prof. B. Studer, Molecular Plant Breeding	350'000	Coop Research Program

Project Title	Time Frame	Principal Investigator	Amount (CHF)	Program
Application of Lactobacillus reuteri to naturally prevent Campylobacter colonization of chicken (CampyChick)	2017 – 2019	Prof. C. Lacroix, Food Biotechnology	274'700	Coop Research Program
New sustainable food formulations based on algae proteins (NewAlgae)	2017 – 2019	Prof. A. Mathys, Sustainable Food Processing	279'935	Coop Research Program
Resilience of organic and conventional production systems to drought (RELOAD)	2017 – 2020	Prof. N. Buchmann, Grassland Sciences	428'843	Mercator Research Program
Ecological intensification of organic rooibos cultivation in South Africa (EcolInt)	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
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

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