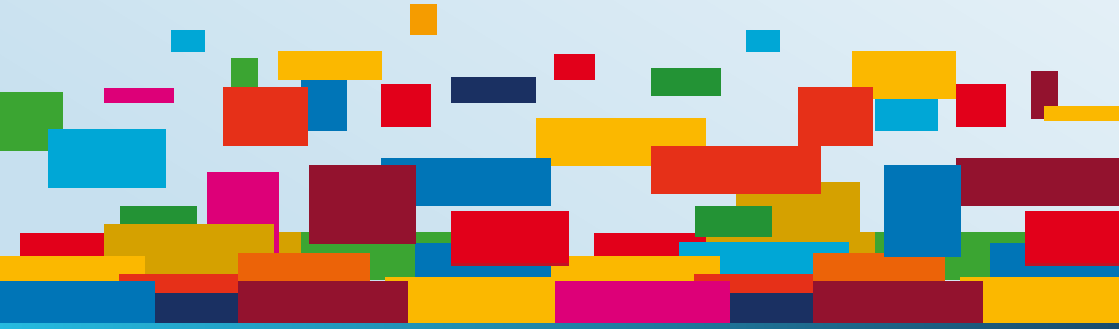
The 8th World Sustainability Forum

15–17 SEPTEMBER 2020 | VIRTUAL



Program and Abstract Book

Organizer

MDPI Academic Open Access Publishing since 1996

University of Basel

Université de Genève

Sponsors

MDPI Sustainability Foundation

CICG

sustainability

energies

soil systems

water

International Journal of Environmental Research and Public Health

climate

environments

resources

Patronage

Sustainable Development Solutions Network – A global initiative for the United Nations

score

Cooperations

Geneva Health Forum – 7th Edition – April 10-12 2018

CRB Centre for Responsible Business – Enabling Change for Impact

Global Footprint Network

NRF National Research Foundation

UN75 2020 and Beyond

73 NRP Sustainable Economy National Research Programme

74 NRP Smarter Health Care National Research Programme

Swiss Programme for Research on Global Issues for Development

Partnering Societies

swiss academies of arts and sciences

futureearth Research, Innovation, Sustainability

saguf

SCORAI Europe

SUSCHEM CH Plateforme Technologique Européenne pour la Chimie Durable

eawag aquatic research

Swiss Women in Chemistry

European Council of Civil Engineers

CWA Constructed Wetland Association

SCS Swiss Chemical Society

SWST – International Society of Wood Science and Technology

IETI IRIEM IDSAI

JSSSPN

ISDR Society

Soil Ecology Society

awwee

Environmental Humanities Switzerland

ISES International Solar Energy Society

Società Idrologica Italiana Italian Hydrological Society

CSME SCGM

The 8th World Sustainability Forum

VIRTUAL
Switzerland
15–17 September 2020

MDPI • Basel • Beijing • Wuhan • Barcelona • Belgrade

Organizing Committees

Conference Chairs

Prof. Dr. Max Bergman
Prof. Dr. Ed Constable
Prof. Dr. Antoine Flahault
Prof. Dr. Marlyne Sahakian
Prof. Dr. Katharina Fromm

Scientific Committee

Prof. Dr. Giuseppe Ioppolo
Prof. Dr. Esther Ngumbi
Professor Hu Jiangyong
Dr. Philipp Aerni
Prof. Dr. med. Evelyne Bischof
Dr. Ruzanna Tarverdyan
Prof. Dr. Yongrok Choi
Dr. Bradley Hiller
Prof. Dr. Elena Cristina Rada
Prof. Dr. Xiaosong Hu
Professor Anthony Lehmann
Dr. Sonia Ehrlich Sachs

Organised by

MDPI
Academic Open Access Publishing
since 1996

Conference Secretariat

Ms. Charlotte Gardini
Ms. Karen Gisler
Ms. Géraldine Leuenberger
Ms. Sara Vulovic
Mr. Cédric Spinnler
Mr. Matthias Burkhalter
Dr. Ana Sanchis
Dr. Franck Vazquez

Email: wsf8@mdpi.com

Welcome from the Chairs

September 2020 marks the 5th birthday of the 2030 Agenda for Sustainable Development and the UN Sustainable Development Goals. If it were a child and given the right circumstances, it would now have developed fine motor skills, be able to stand on one foot for 10 seconds, have long conversations, and start to develop a sense of independence and responsibility. With the 8th World Sustainability Forum, we are not only celebrating this birthday but are also taking stock of where we are in relation to a more sustainable world, what has worked, what has not yet worked, and where we need to go next. Today, the world is a different place from when we were planning this event. To remain relevant, any event must take into account the future impact of events that are unfolding in 2020: a health crisis, followed by economic, political, and social crises.

Sustainability has gained considerable traction: Many countries have integrated sustainability and environmental protection as part of their national development agenda, many businesses have realized the considerable long-term potential in sustainable development, and many research agendas have aligned with sustainability goals. The challenges that mark 2020 give rise to new imaginaries on how to either return to a "new normal" or to forge ahead into a challenging and more sustainable future. The health crisis and its consequences will not guarantee a more sustainable future but it certainly provides a narrow window of opportunity to rethink outdated economic, social, and environmental arrangements. It is encouraging to note the wide-spread calls for a sustainable "new normal".

With this event, we hope to contribute to building a platform and network for sustainability agendas that fosters new partnerships among stakeholders beyond the boundaries of academic disciplines, self-serving national agendas, quarterly spreadsheets, and election cycles. The quest is to conceive of ways to assure long-term sustainable development for people, for regions, and for our planet.

We, the chairs and the organization team, are very much looking forward to welcoming you at the 8th World Sustainability Forum. Let us grab this opportunity to advance the sustainability agenda!

Prof. Dr. Max Bergman
Conference Chair

Prof. Dr. Marlyne Sahakian
Conference Chair

Prof. Dr. Ed Constable
Conference Chair

Prof. Dr. Katharina Fromm
Conference Chair

Prof. Dr. Antoine Flahault
Conference Chair

Certificate of Attendance

Upon request, the participants of the event, who have registered on Sciforum, will receive an electronic Certificate of Attendance by email once the event is concluded.

Table of Contents

General Information

Sustainability (ISSN 2071-1050; CODEN: SUSTDE) is an international, cross-disciplinary, scholarly, peer-reviewed and open access journal of environmental, cultural, economic, and social sustainability of human beings. It provides an advanced forum for studies related to sustainability and sustainable development, and is published semi-monthly online by MDPI. The Society for Urban Ecology (SURE) and Canadian Urban Transit Research & Innovation Consortium (CUTRIC) are affiliated with *Sustainability* and their members receive discounts of the article processing charge.

Among other databases, *Sustainability* is indexed by the Science Citation Index Expanded (Web of Science), MEDLINE (PubMed) and other databases. Full-text available in PubMed Central.

Journal Webpage: https://www.mdpi.com/journal/sustainability
Impact factor: **2.576** (2019)
5-Year Impact Factor: 2.798 (2019)

Program

Program Manager

Dr. Zinette Bergman

University of Basel, Switzerland

Keynote Speakers

Dr. Lidia Borrel-Damián

Secretary General of Science Europe, Brussels, Belgium

Prof. Dr. Felix Dapare Dakora

Tshwane University of Technology, Pretoria, South Africa and President of The African Academy of Sciences

Dr. Simeon Ehui

Regional Director, Sustainable Development for Africa, The World Bank

Prof. Dr. Janet Hering

Director of the Swiss Federal Institute of Aquatic Science & Technology (Eawag)

Prof. Dr. Renato S. Maluf

Universidade Federal Rural do Rio de Janeiro, Brazil

Prof. Dr. Michael E. Mann

Distinguished Professor, Department of Meteorology & Atmospheric Science, Penn State University

Dr. Jing Meng
Bartlett School of Construction and Project Management, University College London

Dr. Natalia Mykhaylova
Founder & CEO of WeavAir

Dr. Antonella Santuccione Chadha
CEO and Co-founder at Women's Brain Project pro bono

Dr. Patrick Degeorges
Director of The Ecole normarle supérieure de Lyon's Antrhopocene Curriculum

Prof. Dr. Joël Mesot
President of ETH Zurich

Dr. Mathis Wackernagel
Co-creator of the Ecological Footprint,
President of Global Footprint Network

Program at a Glance

<table>
<tr><th colspan="5">The 8th World Sustainability Forum
15–17 September 2020</th></tr>
<tr><th></th><th>Tuesday 15 September 2020</th><th>Wednesday 16 September 2020</th><th>Thursday 17 September 2020
Food Security and Agriculture</th><th>Thursday 17 September 2020
Transport and Mobility</th></tr>
<tr><td rowspan="5">Morning</td><td rowspan="5"></td><td>Palm Oil Session 1</td><td rowspan="2">Behavior and Countermeasures for Hazardous Metals in Paddy Agroecosystem</td><td>Disruptive Trends and Inclusiveness (part 1)</td></tr>
<tr><td>Palm Oil Session 2</td><td>Smart Mobility and Digitalization</td></tr>
<tr><td>Agriculture and Development</td><td>Food Choices and Food Waste Management</td><td>Spatial Planning and Transportation Challenges</td></tr>
<tr><td rowspan="2">African Food Systems Transformation to address the SDGs Session A
Panel 1
Panel 2</td><td>Coffee Break</td><td>Coffee Break</td></tr>
<tr><td>Food Security and Covid</td><td>Understanding Impacts</td></tr>
<tr><td rowspan="8">Afternoon</td><td>Welcome from the Chairs and MDPI</td><td rowspan="5">African Food Systems Transformation to address the SDGs Session B
Panel 1
Panel 2</td><td rowspan="2">Agri Supply Chains</td><td rowspan="2">Aspirations and Acceptance (part 1)</td></tr>
<tr><td>General opening</td></tr>
<tr><td>Women in Science</td><td rowspan="2">Can Trade Relations promote Food Sustainability?</td><td rowspan="3">Aspiration and Acceptance (part 2)</td></tr>
<tr><td>Communicating Applied Research to Achieve the SDGs</td></tr>
<tr><td>World Sustainability Award Ceremony</td><td>Linking Research with Action through Transdisciplinary Food System Research</td></tr>
<tr><td>Emerging Sustainability Leader Awards Ceremony</td><td>Sessions A and B: Synthesis and Summary</td><td>The United Nations Forum on Sustainability Standards (UNFSS): Approaches to Sustainable Agri-Food Trade and the 4th UNFSS</td><td rowspan="3">Disruptive Trends and Inclusiveness (part 2)</td></tr>
<tr><td>Poster Presentations</td><td rowspan="2"></td><td>Pesticide control policies and recommendations</td></tr>
<tr><td></td><td>Food losses and Waste Mitigation in Brazil</td><td></td></tr>
</table>

Conference Program

Day 1: Tuesday 15 September 2020

Welcome and General Opening	
13:00-13:10	**Prof. Dr. Max Bergman, Prof. Dr. Katharina Fromm and Dr. Franck Vazquez** Welcome from the Chairs and MDPI
13:15-13:40	**Ed Constable** General Opening - Science meets Sustainability: Friction or fiction?
13:40-14:00	**Joël Mesot, President of ETH Zurich** General Opening
14:00-14:30	**Lidia Borrel-Damián, Secretary General, Science Europe** Women in Science
14:30-15:00	**Janet Hering, Director EAWAG** Communicating Applied Research to Achieve the SDGs
15:15-16:15 World Sustainability Award Ceremony	
15:15-15:45	World Sustainability Awardee
15:45-16:15	World Sustainability Awardee
16:30 -17:45 Emerging Sustainability Leader Awards Ceremony	
16:30-16:45	Emerging Sustainability Leader Awardee
16:45-17:00	Emerging Sustainability Leader Awardee
17:00-17:15	Discussion with the Emerging Sustainability Leaders
17:15-17:45	**Mathis Wackernagel, President of Global Footprint Network** Is the Future already present?
Poster Presentations **17:45-18:45**	

Day 2: Wednesday 16 September 2020

8:00-9:25 -- Session 1. *Palm Oil:*

Chair: Marcel Mballa-Ekobena

Dyah Mardiyaningsih, Arya Dharmawan, Faris Rahmadian
sciforum-031331: Impact of Oil Palm Development for Women: Double Role of Women and Livelihoods Alternative Sources in Rural Households
Audina Amanda Prameswari, Masatoshi Sasaoka, Arya Hadi Dharmawan
sciforum-031349: A Study on Livelihood System of Oil Palm Farming Households under the pressure of Land-Tenure Insecurity in Jambi Province, Sumatra, Indonesia
Ingrid Fromm
sciforum-030449: Land use change, livelihoods and economic development policies: Implications for sustainable palm oil production in Honduras
Fakhrizal Nashr, Eka Intan Kumala Putri, Arya Hadi Dharmawan, Akhmad Fauzi
sciforum-031332: Sustainability of independent oil palm farmers in multi-tier supply chain at Kutai Kartengara district, East Kalimantan province
Fideline Mboringong, Ludovic Miaro, Durrel Halleson, Mesmin Tchindjang, Emmanuel Ngom
sciforum-031075: Mainstreaming sustainability in the palm oil sector in Cameroon
Riska Amalia, Arya Dharmawan, Lilik Prasetyon, and Pablo Pacheco
sciforum-031301: The Problems of Acceptance of Indonesian Sustainable Palm Oil (ISPO) in International Market and its Complexity on the Ground

09:30-11:25 -- Session 1. *Agriculture and Development*

Chair: Philippe Forêt

Antonio Santoro, Martina Venturi, Federica Corrieri, Francesco Piras, Mauro Agnoletti
sciforum-031182: The FAO programme on Globally Important Agricultural Heritage Systems and the opportunities for the sustainable development of rural areas
Dorcas Shumba
sciforum-032278: Digital Based Model for Improving Agricultural Productivity in Africa
Julia Sokol, Georgia Van De Zande, Carolyn Sheline, Fiona Grant, Susan Amrose, Amos Winter
sciforum-031390: Techno-economic feasibility of standard- and low-pressure drip irrigation systems for smallholder farmers
Abdul-Latif Iddrisu, Yari Vecchio, Felice Adinolfi, Marcello De Rosa
sciforum-030657: Geographical indication to build up resilient rural economies: a case study from Ghana
Ali Yansyah Abdurrahim
sciforum-034388: Bawon: The Socio-Economic Security System of Rural Communities in Indonesia
Mónica de Castro-Pardo, Victor Martin Barroso, Pascual Fernández Martínez
sciforum-029252: A proposal of a mixed multi-criteria model to the priorization of ecosystem services in protected areas
Tatiana Bouzdine Chameeva*, Sanjay Sharma, Joerg Hofstetter
sciforum-029330: Drivers of Accelerated Institutional Change Toward Sustainable Viticulture in Bordeaux

	11:30-12:55 -- Session 2*: Urban Farming*
	Chair: Philipp Aerni
	Alessandro Galli, Sara Moreno Pires, Katsunori Iha, Armando Abrunhosa Alves, David Lin, Maria Serena Mancini, Filipe Teles sciforum-034046: Urban Food Footprints: assessing food impacts and policy gaps in Portugal **Kareem Buyana** sciforum-033622: Cities as Transnational Actors in the Resilience of Food Systems: A Gender Perspective **Neginsadat Mirvahedi, Naser Shafieisabet** sciforum-033858: Rural-Urban Reciprocal Interactions and Challenges of Sustainable Food Security **Hartmut Derler, Simon Berner, Stephan Pabst, Ulrike Seebacher, Johannes Haas** sciforum-030608: From a research project to transformational change in an urban food system: findings from an inter- and transdisciplinary research collaboration **Luca Secondi, Ludovica Principato, Giovanni Mattia, Luca Ruini** sciforum-031265: Worksite intervention to reduce food waste among employees **Christina Marouli** sciforum-034373: Food and food waste: Contradictions on the way to caring communities & implications for sustainable development
	Session 3*: African Food Systems Transformation to address the SDGs*
	Session A: Context and Introductions,
	Chair: Prof Frans Swanepoel
	Director ARUA FSNet-Africa, University of Pretoria, South Africa
13:05-13:30	**Keynote Speaker: Dr Simeon Ehui, Regional Director, Sustainable Development for Africa, The World Bank**
13:30-14:30	**Panel 1: Conceptualising the African Food System** **Moderator:** → sciforum-036141: Prof Julian May, Director, DSI-NRF Centre of Excellence in Food Security, and UNESCO Chair in African Food Systems, University of the Western Cape, South Africa (Lead Paper) – 10 min → sciforum-036142: Prof Jane Ambuko, Department of Plant Science and Crop Protection, University of Nairobi, Kenya – 5 min → sciforum-036746: Prof Claire Quinn, Theme Lead, GCRF-AFRICAP and Co-Principal Investigator, FSNet-Africa, University of Leeds, UK – 5 min → sciforum-036139: Prof Hettie Schönfeldt, Director, ARUA Centre of Excellence in Food Security, and SARChI Chair in Nutrition, University of Pretoria, South Africa – 5 min → **Questions to the Panel** – 30 min → **Pannel Summary**: Dr Stefano Marras, Senior Postdoctoral Research Fellow-designate, FSNet-Africa, University of Pretoria, South Africa – 5 min
14:30-15:30	**Panel 2: Gender Roles and the Unequal Status of Women in African Food Systems** **Moderator:** → Dr Wanjiru Kamau-Rutenberg, Director, African Women in Agricultural Research and Development (AWARD), Kenya (Lead Paper) – 10 min

→ sciforum-036350: Prof Justin Pita, Executive Director, West African Virus Epidemiology (WAVE), Ivory Coast– 5 min
→ sciforum-036135: Dr Elizabeth Mkandawire, Research and Network Manager-designate, FSNet-Africa, University of Pretoria, South Africa– 5 min
→ sciforum-036140: Prof Margaret Mangheni, Department of Agricultural Extension, Makarere University, Uganda– 5 min
→ **Questions to the Panel** – 30 min
→ **Pannel Summary**: Dr Farai Kafudzaruwa, Postdoctoral Research Fellow, Centre for the Advancement of Scholarship, University of Pretoria, South Africa– 5 min

Session 3*: African Food Systems Transformation to address the SDGs*

Session B: Context and Introductions,

Chair: Dr Aldo Stroebel

Executive Director, National Research Foundation, South Africa

15:30-16:00 **Keynote Speaker: Prof Felix Dapare Dakora, President, African Academy of Sciences, Kenya, and South African Research Chair in Agrochemurgy and Plant Symbioses, Tshwane**

16:00-17:00 **Panel 1: Climate-Smart Agriculture and Food Systems**
Moderator:
→ sciforum-036136: Prof Andy Dougill, Executive Dean, Faculty of the Environment and Food, and Director, AFRICAP, University of Leeds, UK (Lead Paper) – 10 min
→ sciforum-036137: Prof Cheikh Mbow, Director, Future Africa Institute, University of Pretoria, South Africa– 5 min
→ sciforum-036249: Prof Lise Korsten, Co-Director, DSI-NRF Centre of Excellence in Food Security, University of Pretoria– 5 min
→ **Questions to the Panel** – 30 min
→ **Pannel Summary**: Dr Sepo Hachigonta, Director, National Research Foundation, South Africa– 5 min

17:00-17:45 **Panel 2: Preparing for the 2021 UN Food Systems Summit**
Moderator:
17:00-17:07 Prof Lindiwe Sibanda: Context and Introduction
→ Prof Louise Fresco, President, Wageningen University & Research, The Netherlands, and Vice-Chair of the Scientific Group for the 2021 Food Systems Summit – 10 min
→ Prof Patrick Caron, Vice-President, International Affairs of the University of Montpellier, France, and Member of the Scientific Group for the 2021 Food Systems Summit – 10 min
→ **Pannel Summary**: Moderator– 5 min

17:45-18:15 Sessions A and B: Synthesis and Summary

Chair: Dr Melody Mentz-Coetzee, Senior Researcher, FSNet-Africa, University of Pretoria, South Africa (SA)

Supported by:

Dr Stefano Marras, Senior Postdoctoral Research Fellow, FSNet-Africa, University of Pretoria, SA
Dr Sepo Hachigonta, Director, National Research Foundation, SA
Dr Farai Kafudzaruwa, Postdoctoral Research Fellow, Centre for the Advancement of Scholarship, University of Pretoria, SA

Day 3: Thursday 17 September 2020 - Food Security and Agriculture

07:00-07:55 -- Session 4. ***Behavior and Countermeasures for Hazardous Metals in Paddy Agroecosystem***

Chair: Tomoyuki Makino

T. Makino* and H. Kanno
sciforum-036559: Behavior and Countermeasures for Hazardous Metals in Paddy Agroecosystem
T. Narukawa*, T. Makino, H. Kanno, K. Kimura and S. Yamasaki
sciforum-036563: Effects of soil drying on the chemical form of cadmium and thallium related to manganese oxides
R. Saito*, T. Makino, H. Kanno K, Kimura, S. Yamasaki, S. Ishikawa, T. Abe, H. Nakada, T. Otaguro and H. Nishikawa
sciforum-036574: Absorption characteristics of various metals in low Cd absorption rice cultivar compared to wild type
Yawata*, T. Makino, H. Kanno, K. Kimura, S. Yamasaki and H. Nakada
sciforum-036577: Effects of mixing andisol with alluvial soil on arsenic concentration in brown rice and elucidation of its mechanism
H. Takenaka*, T. Makino, H. Kanno, K. Kimura, S. Yamasaki, and H. Nakada
sciforum-036582: A comprehensive analysis of the mitigation on cadmium and arsenic in rice plants by various silicate materials produced in Japan

8:00-9:30 -- Session 5. ***Food Choices and Food Waste Management***
Chair: Marcel Mballa-Ekobena

Belinda Li, Virginia Maclaren, Tammara Soma
sciforum-032120: Effectiveness of awareness campaigns in shifting practices to reduce household food waste
Petra Bättig, Rahel Meier, Verena Berger
sciforum-029483: Zombie attack! Using scientainment to teach about sustainable food
Tonia Ruppenthal, Izabela Horoś
sciforum-031798: Food waste management in retail: A regional perspective
Pascal Ohlhausen, Nina Langen, Fara Steinmeier, Silke Friedrich, Tobias Engelmann, Melanie Speck, Petra Teitscheid
sciforum-031651: Why it is not that easy to apply nudges to stimulate sustainable food choices out-of-home; Insights from real-world experiments
Canxi Chen, Abhishek Chaudhary, Alexander Mathys
sciforum-030918: Tackling food sustainability through dietary change: a scenario analysis for Switzerland
Sonja Trachsel, Moritz Lüchinger, Isabel Jaisli
sciforum-031661: Motivations for sufficiency in individual dietary decisions – a typology

9:30–10:00 **Coffee Break**

10:00-11:25 -- Session 6. ***Food Security and Covid***

Chair: Max Bergman

Mariella Nocenzi, Barbara Di Giovanni, Ombretta Presenti, Claudia Zoani
sciforum-034219: Communicate about food and health at the pandemic time
G M Monirul Alam, Most Nilufa Khatun

sciforum-033896: Impact of Lockdown on vegetables supply chain and food security: Empirical evidence from Bangladesh
Paola Vera, Ricardo Cristhian Morales Pelagio, Miguel Angel Reyna Castillo
sciforum-034322: Financialization and food security: the effects of Covid-19 for the Latin American region
Cynthia Akwei
sciforum-034410: The Impact of Covid19 on Sustainable Development Goal2 in Ghana
Suaad Jassem, Mohammad Razzak
sciforum-033777: Achieving Food Security in the Post Covid-19 Era through High-Tech Vertical Indoor Farming in Densely Populated Cities

11:30-12:25 -- Session 7. *Agri Supply Chains*
Chair: Marcel Mballa-Ekobena

Eliseo Vilalta-Perdomo, Rosario Michel-Villarreal
sciforum-034225: Analyzing the critical effect of business logistics performance on food security and agriculture
Inmaculada Martinez-Zarzoso, Laura Barros
sciforum-033399: International Trade and Sustainable Development: Special Focus on Food Security
Elliot Woolley, Aicha Jellil, Alessandro Simeone
sciforum-034029: Addressing food supply chain resilience through intelligent management of household consumption
Daiane Johann, Carlos Ramoa
sciforum-034242: Sustainable Entrepreneurship in Agribusiness: The Case of an Agro-industrial Cooperative

12:30-12:55 **Keynote: Prof Renato Maluf**

13:00-14:25 -- Session 8. *Can Trade Relations promote Food Sustainability?*
Chair: Eisabeth Bürgi-Bonanomi

Stefan Mann
sciforum-030325: Towards a post-lethal agricultural system
Mario Giampietro, Juan Cadillo-Benalcazar, Ansel Renner
sciforum-032248: A nexus approach to study the sustainability of social-ecological systems: implications for SDG governance
Johanna Jacobi
sciforum-031288: Farmers' perceptions and the potential of participatory guarantee systems in Bolivia for sustainable trade and diversified food systems
Emily Mutea, Stephan Rist, Johanna Jacobi
sciforum-031270: Does agricultural commercialization lead to food security? Evidence from smallholder farms north-west of Mount Kenya
Xosé A Armesto-López, M. Belén Gómez-Martín, Martí Cors-Iglesias, Emilio Martínez-Ibarra
sciforum-031365: Geographical notes about post-productivist food in Spain. the reflections of producers, processors and marketers on food sustainability

14:30-15:55 -- Session 9 . *Linking Research with Action through Transdisciplinary Food System Research*
Chair: Boniface Kiteme

Stellah Mukhovi, Boniface Kiteme, John Mwangi, Grace Wambugu

	sciforum-031230: From Research to Action: Participatory Transformation and Sustainability of Farmers Milk Cooperative in Agropastoral Community in Laikipia, Kenya **Andréia Tecchio, Aymara Zonta, Johanna Jacobi, Adriana Bessa** sciforum-031200: Transformative collective action to change the legistlation prohibition raw milk cheese in Seara, Santa Catarina, Brazil **Aymara Llanque Zonta, johanna jacobi** sciforum-031274: Transformations towards food sustainability: A transdisciplinary method for collective action in Latin America and Africa **Florjan Bombaj** sciforum-031564: The economic potential of organic dairy products in the Albanian mountain areas and the impact of organic farming in the national food security issues. What challenges and prospects? **Rodrigo Rudge Ramos Ribeiro, Samia Nascimento Sulaiman** sciforum-033816: Risk Perception by a Participatory Diagnostic Approach: a Case Study with Coffee Farmers at Chapada Diamantina, Brazil **Mathis Wackernagel, Leo Wambersie, Alessandro Galli, David Lin** sciforum-034296: Identifying Famine-Prone Countries
16:00-16:25	**Keynote: Patrick Degeorges, Director of The École normale supérieure de Lyon's Anthropocene Curriculum**
16:30-17:30 -- Session 10 . ***The United Nations Forum on Sustainability Standards (UNFSS): Approaches to Sustainable Agri-Food Trade and the 4th UNFSS*** **Chair: Santiago Fernandez De Cordoba Briz**	
	Axel Marx, KU Leuven Upscaling Sustainability Standards through Public Procurement and Trade Policy **Clara Brandi, German Development Institute (DIE) (TBC)** Voluntary Sustainability Standards as an instrument to achieve the SDGs **Cristina Larrea, IISD/Cecilia Heuser or Niema Elamin, UNCTAD (TBC)** Alleviating Poverty with VSS through Trade **Rodrigo Rupérez** Andean Community and CARICOM case studies **Christian Robin, SECO** Promoting trade through VSS
17:45-18:05	**Invited Speaker: Prof Tomaz Langenbach, Pesticide control policies and recommendations**
18:10-19:45 -- Session 11 . ***Food losses and Waste Mitigation in Brazil*** **Chair: Prof. Felicitas Schneider**	
	Felicitas Schneider sciforum-034517: Challenges and opportunities of Food Loss and Waste Action for Latin America **Gilmar Henz** Current situation of food security and FLW in Brazil **Luciana Marques Vieira** sciforum-036555: Multi-stakeholder initiative for FLW mitigation **Daniele Eckert Matzembacher** sciforum-034475: Entrepreneurship opportunities **Andrea Lago da Silva, Camila Colombo de Moraes**

sciforum-034482: Causes of food waste and practices for mitigation: evidence from Brazilian supermarkets and suppliers
Gustavo Porpino
Consumer food waste: the Brazilian perspective

19:45 - 19:50 **Max Bergman -- Closing Remarks**

Day 3: Thursday 17 September 2020 – Transport & Mobility

08:00 - 08:50 -- Disruptive trends and inclusiveness (part 1)

Chair: Marlyne Sahakian

Marlyne Sahakian
Introduction
Sujayita Bhattacharjee
sciforum-033976: Beyond Mobility: The Practicality of 'Working From Home' as an Alternative to Daily Commuting for the Working Women of Mumbai Metropolitan Region
Benjamin Jacobsen
sciforum-033891: Corporate Car Sharing With Incentive System for Ecologically Sustainable Driving as an Alternative for Ecologically and Ecologically Sensible Short and Medium Business Trips
Puja Banerjee
sciforum-034365: Micro-Mobility and Mobility Sharing: A Shift Towards a Clear and Sustainable Urban Future
Q&A

08:50 - 09:30 -- Smart Mobility and Digitalization

Chair: Marlyne Sahakian

Ana Pego
sciforum-033627: Smart Mobility in the Mediterranean Cities. A Case Study of the Effects of Externalities in Cities
Dhawala Anand, Ali Soltani, Andrew Allan
sciforum-033801: Potential Impacts of Autonomous Vehicles (AVs) on Carbon-Free Commuting of Tertiary Students
Samuel Chng, Lynette Cheah
sciforum-034019: The Future of Road Public Transit: Autonomous and Accepted? Singapore
Hamid Doost Mohammadian
sciforum-033507: Urban Mobility Planning, Environmental Challenges, and Digitalization – Key to Blue-Green Smart City and Mobility as a New Concept With Using the I-Sustainability Plus and 5th Wave Theories (Case Study: South Korea and Germany)
Q&A

9:40–10:20 **Break**

10:20- 11:30 -- Spatial Planning and Transportation Challenges

Chair: Christoph Ratz

Wann-Ming Wey
sciforum-030828: A Study of Utilizing Big Data to Construct Sustainable City's Transportation Planning and Design Evaluation Model
Elaine Vazquez, Beatriz Rodrigues, Mohammad K Najjar, Assed Haddad, Ahmed W A Hammad
sciforum-033769: Proposed Framework for Assessing the Priority Location of New Medium and High Capacity Transport Stations
Q&A
Damiana Chinese, Massimiliano Breda
sciforum-033804: Prospects for Alternative Powertrains for Road Freight Transport in Italy Based on a Probabilistic TCO Model
Viktorija Mangaroska, Kosta Mangaroski
sciforum-034399: Sustainable Development Plan of Transport and Mobility in the City of Skopje
Longbin Zhu, Hongyan Xiang
sciforum-034024: Built Environment of Settlements and Carbon Emission of Household Travel: A Case Study in the Central Area of Nanjing City
Q&A

11:30–12:10	**Break**

12:10-13:30 -- Understanding Impacts

Chair: Christoph Ratz

Mashael Kamran, Marco Raugei, Allan R. Hutchinson
sciforum-031256: Life Cycle Assessment of the Future Light Duty Vehicle Fleet in the UK – Taking Stock of the Co-Evolution of the Transport and Energy Sectors
René Parra
sciforum-034069: Influence on the Air Quality of Cuenca (Ecuador) Due to the Future Shift From Diesel to Electric Buses
Kameswara Prakash, Chockalingam Aravind Vaithilingam, Gowthamraj Rajendran, Agileswari Ramasamy
sciforum-034143: Design and Analysis of Sustainable Photovoltaic Based Peripatetic Charging Infrastructure
Q&A
Gowthamraj Rajendran, Chockalingam Aravind Vaithilingam, Kameswara Satya Prakash, Kanendra Naidu
sciforum-034146: Design and Development of Charging Stations Based on VOC - VR for Sustainable Electric Mobility
Samuele Marinello
sciforum-034405: The Impact of the COVID-19 Emergency on Local Vehicular Traffic and Its Consequences on the Environment: The Case of the City of Reggio-Emilia (Italy)
Zhanna Mingaleva
sciforum-034251: Transport Sustainability in a Pandemic
Q&A

13:30–14:40	**Break**

14:40- 15:30 -- Aspirations and Acceptance (part 1)

Chair: Marlyne Sahakian

Lakshmi Thilagam Natarajan

sciforum-034157: Lessons Learnt From Singapore Towards an Efficient Public Transport Policy: A Case Demonstration for the City of Puducherry

Gonzalo Salazar

sciforum-032247: Mobility and Intercultural Diversity in Intermediate Urban Systems of Latin America: An Approach From the New Mobility Paradigm

Juan Antonio Carrasco, Beatriz Cid, Gislaine Granfeldt, Carolina Leal, Carolina Rojas

sciforum-034323: Mobility and Accessibility to Healthy Food in the Global South: Assessing the Role of Open Street Markets in Chile

Naoki Takayama, Hitomi Sato, Meilan Jiang, Takayuki Morikawa

sciforum-034337: Analysis of the Intention of Teleworking Considering Risk Perceptions of Commuting and ICT Use

Q&A

15:30–16:00 **Break**

16:00- 17:30 -- Aspiration and Acceptance (part 2)

Chair: Marlyne Sahakian

Samuel Chng

sciforum-032556: Understanding Citizen's Aspirations for Their Cities' Mobility and Its Relationship With Acceptance of Autonomous Vehicles: A Case Study of Singapore

Rashmi Sadana

sciforum-033738: Mass Transport, Urban Governance, and Everyday Life: A Case Study of the Delhi Metro

Kevin Dillman, Michał Czepkiewicz, Jukka Heinonen, Reza Fazeli, Áróra Árnadottir, Brynhildur Davíðsdóttir

sciforum-033870: Decarbonization Scenarios for Reykjavik's Passenger Transport: The Combined Effects of Behavioral Changes and Technological Developments

Stavros Triantafyllidis

sciforum-034091: Transportation and Sport Events: Understanding Consumers Carbon Offsetting and Sustainable Mobility Behaviors

Q&A

Antonio Martínez Raya, Víctor M. González-Sánchez

sciforum-034402: How do public service obligations affect transportation for less developed regions of the European Union: The case of scheduled air services between Badajoz and Barcelona

Daniela Palmas, Omar Ismael Ramírez, Rocío del Carmen Serrano-Baqruín

sciforum-034260: Knowledge of the Sustainable Development Goals (SDG) in the Recovery of Domestic Tourism in Mexico

Namrata Shah

sciforum-031363: Envisioning Transportation Corridors as an Integral Part of Cultural Landscapes - a Case of Ahmadabad, India

Q&A

17:30–18:00 **Break**

18:00- 18:40 -- Disruptive Trends and Inclusiveness (part 2)

Chair: Christoph Ratz

María del Mar Alonso Almeida

sciforum-034264: Shared Mobility in Cities After COVID-19: Changes in Offer and Demand in Europe
Wendy Purcell
sciforum-033640: Examination of the Auto Sector: Equity Through Mobility Solutions
Zhaowen Liu
sciforum-034270: Towards inclusive urban accessibility: framework and methodology for urban transport inclusiveness assessment
Q&A

18:40-18:45 **Ed Constable**
Closing Remarks

Food Security & Agriculture Poster Session

Sciforum ID	Authors	Poster Title
sciforum-033790	Akbar Hossain, Khondoker Abdul Mottaleb, Tofazzal Isla, M Israil Hossain	BARI Gom 33', a newly released miracle wheat variety in Bangladesh for mitigation of zinc deficiency and wheat blast disease
sciforum-031977	Cristina Oliveira, Carla Ragonezi, Miguel Ângelo Pinheiro de Carvalho	Community structure of Arbuscular Mycorrhizal Fungi in agricultural soils from Madeira Archipelago
sciforum-033967	Peiyuan Liu, Yuxiong Huang, Slav Hermanowicz	Comparative Evaluation of Efficacy on Plant Diseases between Nanopesticides and Conventional Analogues
sciforum-034321	Edier F Ávila, Nazly Yolieth Martin Culma, Nelson E Arenas	Extension of the agricultural border in the Sumapaz paramo from Cundinamarca province, Colombia
sciforum-034102	Alexander K Lautensach, Cameron Carlson, Sabina Lautensach	Food Security in the Arctic: Prospects and Choices in the Anthropocene
sciforum-031965	O. Ravaka Andriamihaja, Florence Metz, Julie G. Zaehringer, Manuel Fischer, Peter Messerli	Identifying Agents of Change for Sustainable Land Governance
sciforum-033645	Isaac Zuñiga Aguilar	Impact of Cooperative Innovation Methodology on Prospecting for Fair Trade Organic Niche as an Incentive for Agricultural Sustainability
sciforum-033945	Kurt A. Rosentrater, Rashid Suleiman	Periodic Physical Disturbance is a Sustainable Method to Control Insect Infestation in Cereal Grains
sciforum-030679	Rasa Kimbirauskiene, Kestutis Romaneckas, Aida Adamaviciene, Ausra Sinkeviciene, Sidona Buragiene	The effect of tillage systems on Planosol properties in faba bean cultivation
sciforum-034142	Isabella Perez, Youngsang Kwo	Urban Farming in Seoul: building food resilience in low-rise neighborhoods
sciforum-034131	Esteve Giraud, Rimjhim Aggarwal	Urban food autonomy: a path of care towards sustainability
sciforum-034022	Mary Thornbush	Using the Ecological Footprint and biocapacity accounting for learning and fostering change
sciforum-033831	Ashley L Fowler, Mieke Brummer-Holder, Karl A Dawson	A comparison of mineral leaching from equine feces and equine-sourced compost
sciforum-032273	Paolo Tamagnone, Elena Comino, Maurizio Rosso, Luis Cea	A numerical model approach to evaluate the efficiency of indigenous rainwater harvesting techniques for agriculture

sciforum-033766	Larissa Seabra, Virgílio Strasburg, Vanuska Lima Silva, Sankya Saraiva, Liana Galvão Bacurau Pinheiro, Luciana Dias Oliveira	Acceptability of cashew nut cookies: encouraging the use of sociobiodiversity foods in school feeding program
sciforum-033589	Farzad Rassaei	Adsorption Kinetics of Cadmium and Zinc in Calcareous Soils of Fars-Iran
sciforum-033686	Joseph Phir, karel Malec, Socrates Kraido Majune, Seth Nana Kwame Appiah-Kub, Zdeˇnka Gebeltová, Mansoor Maitah, Kamil Maitah, Kamal Tasiu Abdullahi	Agriculture as a Determinant of Zambian Economic Sustainabilty.
sciforum-030483	Henrique J.O. Pinho, Dina M.R. Mateus	Algae production using reclaimed water treated by constructed wetlands filled with solid waste
sciforum-034343	Farcas Anca Corina, Sonia Ancuta Socaci, Carmen Socaciu, Liana Claudia Salanta, Maria Tofana, Carmen Pop	An innovative approach of food waste exploitation – A case study
sciforum-034798	Katarzyna Pietrucha-Urbanik	Analysing consumers' perceptions related to the sustainable supply of tap water in crisis situations
sciforum-034403	Adrian Alejandro Gonzalez Rodriguez, Nazly Yolieth Martin Culma, Nelson Enrique Arenas Suarez	Applications of agriculture precision for the rice crop management in colombia
sciforum-033786	Alessandro Scuderi, Giuseppe Timpanaro, Mariarita Cammarata, Claudio Bellia, Vera Foti2, Biagio Pecorino, Gaetano Chinnici, Mario D'Amico, Gioacchino Pappalardo	Approaches and tools for the assessment of sustainable agriculture: the case study of organic livestock in the Mediterranean region
sciforum-034187	Adnan Abubakr, Masood Ul-Hassan Balkhi	Aquatic Macrophyte, Lemna minor: A potential Organic food and Nutrient Recoverer.
sciforum-031991	Carla Ragonezi, Cristina Oliveira, Miguel Ângelo Pinheiro de Carvalho	Bacterial Community Structure From Madeira Archipelago assessed by Terminal Restriction Fragment Length Polymorphism
sciforum-033942	Iva Jestratijevic, Jana Hawley	Better cotton, better jeans: Sustainable Cotton in the Global Denim Industry
sciforum-034391	Faryad Khan, Mansoor Ahmad Siddiqui	Biological management of Meloidogyne incognita damaging carrot through Syncephalsatrum racemosum
sciforum-032025	Ibone Ametzaga_Arregi, Lorena Peñ1, Miren Onaindia, Maria Maestre	Canteen food waste: a simple way to open eyes to sustainability

sciforum-034031	Julie Hurdebise, Isabelle Dufrasne, Françoise Lessire	Carbon footprint of 2 Belgian farms assessed by 2 different tools.
sciforum-034070	Viola Somogyi, Ransford Okley Tetteh, Réka Haraszti Hargitai, Viktória Pitás	Challenges in poultry wastewater treatment under different temperature regimes.
sciforum-033378	Ilaria Langasco, Antonino Spanu, Gavino Sanna, Matteo Babbi, Francesco Barracu, Mario Deroma, Andrea Mara, Maria Itria Pilo, Marco Serra, Nadia Spano	Changes of bioaccumulation of oligoelements and rare earth elements in rice grain at varying of the irrigation methods
sciforum-033860	Veronica Sanda Chedea, Cristina Mihaela Balaceanu, Liliana Lucia Tomoiaga, Ionel Zatreanu, Maria Lucia Iliescu	Climate change- the ground for improving the cultivated assortment of grapevine varieties with new autochthonous disease tolerant grapevine varieties
sciforum-034103	Paul Ofei-Manu	Climate fragility risks: An Exploratory Research on the Tension over Resource Use between Crop Farmers and Cattle Herders in the Afram Plains of Ghana.
sciforum-033593	Charles Francis, Geir Lieblein, Anna Marie Nicolaysen, Tor Arvid Breland, Lutgart Laenarts	Co-Learning Enhances Design of an Agroecology Learning Landscape
sciforum-034114	Shiyong Song, Yuxia Xing	Conflict and Countermeasures between Sustainable Agricultural Food Safety and Trade Secret Protection in China
sciforum-034390	Mayra Monteiro Viana1, 2, Luisa Boudens1, Solange Alfinito1, Mariana Valle1	Consumer's information, motivations, and behavioral skills related to being engaged in a Community-Supported Agriculture (CSA)
sciforum-030569	Julia Stuijfzand, Amanda Lejbowicz, Catherine Longo, Ashleigh Arton, Oluyemisi Oloruntuyi	Contributions of the Marine Stewardship Council (MSC) certification scheme to the Sustainable Development Goals (SDG)
sciforum-033605	Mohamad Hesam Shahrajabian, Wenli Sun, Qi Cheng	Cover and Catch Crops for Sustainable Agriculture
sciforum-033619	Thomas Bilaliib Udimal	Determinants of refugees choice of food transfer options in the rohingya settlement camps in southeastern bangladesh
sciforum-032017	Carla S.S. Gouveia, José F.T. Ganança, Jan J. Slaski, Vincent Lebot, Miguel Â.A. Pinheiro de Carvalho	Determination of Abscisic Acid in Taro (Colocasia esculenta (L.) Schott) Grown in Drought Conditions
sciforum-034421	Jonata M. Ueda, Mariana C. Pedrosa, Márcio Carocho, Sandrina A. Heleno, Lillian Barros	Development of natural preservatives for the food industry: An integrated strategy focused on the use of sustainable, low cost and efficient processes.

sciforum-034111	Devshree Devidas Bhale	Edible starch coating: for improved shelf life of perishable fruits and vegetables
sciforum-034554	César S B Costa, Kennia B Doncato	Effects of saline effluent irrigation on vegetative growth and reproduction of different progenies of the sea asparagus Salicornia neei Lag.
sciforum-034207	Mariana C. Pedrosa, Jonata M. Ueda, Sandrina Heleno, Marcio Carocho, Lillian Barros	Efficacy, Sustainability and Safety of Natural Food Preservatives: A Study on Muffins Preserved with Plant Extracts
sciforum-030772	Sidona Buragiene, Egidijus Sarauskis, Kestutis Romaneckas, Aida Adamaviciene, Rasa Kimbirauskiene	Energy evaluation of faba bean crop
sciforum-033958	Maria Hatjiathanassiadou, Sthephany Rayanne Gomes de Souza, Josimara Pereira Nogueira, Diogo Vale, Virgílio José Strasburg, Priscilla Moura Rolim, Larissa Mont'Alverne Jucá Seabra	Environmental impacts and institutional foodservices: a case study of a Brazilian restaurant
sciforum-031255	Annamaria Mazzoni	Environmental sustainability for ensuring food self-sufficiency in case of exogenous shocks: Qatar case study
sciforum-034374	Zebus Sehar, Nafees Ahmad Khan	Ethylene increases sulfur-assimilation to revert glucose-mediated photosynthetic repression in mung bean (Vigna radiata L.) under salt stress
sciforum-033793	Abreham Berta Aneseyee	Evaluation of Ecosystem Services Associated with Land Use/Land Cover Change at Winike Watershed, Omo gibe basin, Ethiopia
sciforum-034417	Samuel Quintero-Herrera, José Enrique Enrique Botello-Álvarez, Damien Evrard, Peggy Zwolinski, Pasiano Rivas-García	Evaluation of fertilizer formulation for livestock feed production in Mexico: an eco-efficiency and parametric programming approach
sciforum-030124	Hasrul Hazman Hasan, Siti Fatin Mohd Razali, Nur Shazwani Muhammad	Evaluation of the reliability of hydrological drought indices.
sciforum-034532	Praveen Kumar	Evaluation of toxic effects of hexavalent chromium on the quality and nutritive value of Sorghum
sciforum-034408	Nelson Enrique Arenas Suarez, Jehison Torres Torres, Edwin Davier Correa	Factors affecting sustainable food security under the "One Health" approach in the Sumapaz region, Colombia
sciforum-031307	Ibnu Budiman	Farmers behavior regarding sustainable farm management and uptake of (technological) innovation

sciforum-034680	Mohamad Hesam Shahrajabian, Wenli Sun, Ali Soleymani, Peiman Zandi, Mehdi Khoshkharam, Qi Cheng	Fenugreek, a Unique Herb and a Natural Medicine for Organic Life
sciforum-034244	Federico Ohlmaier-Delgadillo, Agustín Rascón-Chu, Elizabeth Carvajal-Millán, Yolanda López-Franco, María A. Islas-Osuna	Ferulated Pectins from Sugar Beet Bioethanol solids as a potential texturizer
sciforum-034344	Sonia Ancuta Socaci, Anca Corina Farcas, Delia Michiu, Francisc Vasile Dulf, Oana Lelia Pop, Liana Claudia Salanta, Maria Tofana	Further exploitation of citrus peels waste after the extraction of essential oils
sciforum-033664	Ghulam Zakir-Hassan, Catherine Allan, Jehangir F. Punthakey, Faiz Raza Hassan	Groundwater and sustainable food security-A case study from Punjab, Pakistan
sciforum-034537	Kadda Hachem, Yasmina Benabdesslem, Samia Ghomari	Histological study of callogenesis in Cicer arietinum and search for genotypes resistant to Ascochyta rabiei
sciforum-034034	Dongliang Zhang, Zhen Peng, Ping Wang	How to develop leisure agriculture to promote the sustainable development of Chinese agriculture
sciforum-034382	Alana Kluczkovski, Rebecca Lait, Leticia Baird, Angelina Frankowska, Bruno Cruz, Bruna Cerqueira, Camilla Almeida de Menezes, Carla Adriano Martins, Christian Reynolds, Jacqueline Tereza da Silva, Neuzair Vianna, Renata Lago, Ximena Schmidt Rivera, Sarah Bridle	How to engage schools with food sustainability? An analysis of environmental impacts of school menus and development of educational materials in Bahia, Brazil
sciforum-030060	Tewodros Tena, Phenny Mwaanga, Alick Nguvulu	Impact of Land Use/Land Cover Change on Hydrological Components in Chongwe River Catchment,Zambia
sciforum-033839	Felipe Das Neves Monteiro, Karina dos Santos Falcão, Elyson Thiago de Souza Florentim, Roniedison da Silva Menezes, Rafael Silva Ferreira, Helen Caroline Rodrigues Correa, Mayara dos Santos Simões, Elói Panachuki	Impact of the no-tillage system on the reduction of soil loss in the Brazilian Cerrado
sciforum-034681	Mohamad Hesam Shahrajabian, Wenli Sun, Ali Soleymani, Peiman Zandi, Mehdi Khoshkharam, Qi Cheng	Improve Food and Nutrition Security by Considering Medicinal Plants for Organic Live Stock Production

sciforum-034351	Antoanela Patras, Vasile Stoleru	Increase of phenolic antioxidants content of white cabbage treated with new-generation fertilizers in sustainable agriculture
sciforum-034412	Mayuri Roy Choudhury, Rimjhim Aggarwal	Innovations to achieve food and water security: Evaluating the system level benefits of water conservation technologies in India
sciforum-034307	Karina Batista, Ivani Pozar Otsuk, Luciana Gerdes, Bruna Zanini Uzan, Leticia Batista Lacerda, Mayne Barboza Sarti	Intercropping system soybeans with forages for a sustainable production
sciforum-031306	Helena Wehmeyer, Melanie Connor	Introducing Sustainable Farming Practices in Rice Production to Myanmar's Transitioning Agriculture Sector
sciforum-034386	Dasuni Dayananda, Jeevika Weerahewa	Investment Options for Restoration of Village Tank Cascade Systems in Sri Lanka: An Analysis using a Linear Programming Model
sciforum-032540	Karolina Rodriguez	Malawi's food security: two decades of agricultural trends and challenges, new perspectives
sciforum-030113	David Ortega-Gaucin, Alejandro Ordoñez, Oscar Rojas, Tamara Hernández, Jesús de la Cruz	Monitoring and probabilistic forecasting of agricultural drought through country-level ASIS
sciforum-033484	Dario Caro, Fabio Sporchia	Multiple resource use associated with pig feed consumption in the European Union
sciforum-034101	Yubia De Anda-Flores, Elizabeth Carvajal-Millan, Jaime Lizardi-Mendoza, Agustin Rascon-Chu, Ana Luisa Martínez-López, Judith Tanori-Cordova	Nanoparticles based on ferulated arabinoxylans recovered from maize by-product
sciforum-034425	Long Ho, Peter Goethals	Opportunities and Challenges for the Sustainability of Lakes and Reservoirs in Relation to the Sustainable Development Goals (SDGs)
sciforum-034376	Lucio Rodrigo Alejo Vargas, Rahul Anantharaman, Simon Roussanaly, Shareq Mohd Nazir	Pathway to Sustainable Negative Emission Ammonia Fertilizer Production
sciforum-034109	Maria Lucia Iliescu, Liliana Lucia Tomoiaga, Elena Andreea Pop, Alexandra Doina Sirbu, Vlad Botea, Anamaria Calugar, Anca Cristina Babes, Veronica Sanda Chedea	Potential effects of climate change on vine phenology and grape ripening in Târnave vineyard
sciforum-034389	Liana Claudia Salanță, Maria Tofană, Carmen Rodica Pop, Sonia	Potential use of bioactive compounds from hops

	Socaci, Anamaria Pop, Teodora Coldea, Anca Corina Fărcaş, Valentina Maria Socaciu	
sciforum-034319	Sthephany Rayanne Gomes de Souza, Maria Hatjiathanassiadou, Josimara Pereira Nogueira, Diogo Vale, Virgílio José Strasburg, Priscilla Moura Rolim, Larissa Mont'Alverne Jucá Seabra	Processing level and origin of food purchase by a Brazilian Institutional Restaurant
sciforum-033579	Viktoriia Hetmanenko, Ievhen Skrylnyk, Anatolii Kucher, Angela Kutova	Production of Organic Amendment based on Leonardite for Highly Effective Soil Organic Carbon Increasing
sciforum-033817	Lúcia P. de Souza, Virgílio José Strasburg, Julian Cabreira, Maurício P. Schnepfleitner	Purchase of family agriculture foods by nutrition service in a public hospital in brazil
sciforum-034138	Pedro D. Gaspar, Tânia M. Lima, Pedro D. Silva, Fernando Charrua-Santos	Quest for sustainable solutions in the agroindustrial sector – A portuguese approach
sciforum-033969	Ramesh Kumar	Regional Dimensions in Agricultural Performance and Food Security in India: Different Plans and different actions
sciforum-029825	Hasrul Hazman Hasan, Siti Fatin Mohd Razali, Nur Shazwani Muhammad	Regionalisation of Hydrological Drought Across Peninsular Malaysia
sciforum-031536	Natalia Maehle1, Roberta Capitello2, Ioana Todirica2, Gergely Szolnoki3, Signe Nelgen3, Maria Claudia Diaconeasa4, Alina Zaharia4, Gabriel Popescu4, Florentina Constantin4	Regulatory context and stakeholders' perceptions regarding sustainable food in Europe
sciforum-034384	Saba Fatima, Prof. Mansoor A. Siddiqui,	Screening for resistance in spinach cultivars: a sustainable nematode management approach
sciforum-031370	Amruta Vungarala	Slicing through the sparse
sciforum-033999	Dijana Likar, Maria Paula Mendes	Smart Water Management for Sustainable Agriculture
sciforum-034366	Camila Valdejane Silva de Souza, Diôgo Vale, Natalie Marinho Dantas, Maria Hatjiathanassiadou, Larissa Mont'Alverne Juca Seabra	Sociodemographic factors and water footprint of Brazilian adolescents' diet
sciforum-034360	Diôgo Vale, Natalie Marinho Dantas, Camila Valdejane Silva de	Spatial analysis of the water footprint of Brazilian adolescents' diets

	Souza, Maria Hatjiathanassiadou, Larissa Mont'Alverne Juca Seabra	
sciforum-033072	Ilaria Langasco, Antonino Spanu, Gavino Sanna, Francesco Barracu, Mario Deroma, Andrea Mara, Maria Itria Pilo, Marco Serra, Nadia Spano	Sprinkler irrigation: an "heretical" method aimed to minimize the bioaccumulation of toxic elements in rice grain
sciforum-032240	Nína M. Saviolidis, Gudrun Olafsdottir, Hildigunnur Sigurdardottir, David Schamari, Antonella Samoggia, Laura Brimont5, Elise Huber, Pierre-Marie Aubert, Mariana Nicolau, Sigurdur G. Bogason	Stakeholders' perceptions on policy tools in support of sustainable food consumption in Europe: policy implications
sciforum-034110	Shivkanya Sambayya Aitwar	Studies on Development of Edible Crockery
sciforum-033606	Valentina Maria Merlino, Stefano Massaglia, Danielle Borra, Simone Blanc	Sustainability in the cow milk offer: comparison between commodity and specialties
sciforum-033990	Liliana Lucia Tomoiaga, Maria Lucia Iliescu, Horia Silviu Racoare, Vlad Botea, Alexandra Doina Sirbu, Veronica Sanda Chedea	Sustainable solutions for the reconstruction and consolidation of useful fauna biodiversity- case study the vineyards in central Transylvania
sciforum-034320	Ifeoma Juliet Opara, Ukoha Pius Oziri, Obasi Nnamdi Lawrence, Nwachukwu Ekere	Synthesis of Biochar ; Potential application in Plant Seedling growth, Effect of co-application of Humus organic fertilizer and biochar on plant seedling growth
sciforum-034347	Mary Richards, Ximena Schmidt, Shona Koren Paterson, Steven Sam, Olwenn Martin, Stephen Syampungani, Kaluba Siuluta Victor, Justin Munyaka, Mweene Mimba	The ESKE Project: a South-North educational and knowledge exchange framework to enhance food security and livelihoods
sciforum-033610	Weronika Kruszelnicka	The function of energy-environmental assessment of the comminution of waste from processing agricultural materials for energy purpose
sciforum-034048	Andres Maria Ramirez	The homegarden as a food safety strategy. Tlaxcala, Mexico case study
sciforum-034331	Nelson Enrique Arenas Suarez, Bersi Vanessa Zuñiga, Jeisson David Torres	The impact of illegal animal trafficking in Colombia

sciforum-031119	Aida Adamavičienė, Kęstutis Romaneckas, Edita Eimutytė, Jovita Balandaite, Sidona Buragienė, Rasa Kimbirauskienė	The impact of non-chemical weed control methods on the soil nutrients in organically grown sugar beet cultivation
sciforum-033886	Krystyna Rejman, Joanna Kaczorowska, Aleksandra Prandota, Ewa Halicka	The importance of food certification labels for Warsaw and Brussels residents
sciforum-033615	Aleksey Sidorchuk, Valentin Golosov	The losses of Russian Chernozem soils during the agricultural period
sciforum-033749	Carmen Valentina Rădulescu, Dumitru Alexandru Bodislav, Sorin Burlacu, Florina Bran, Mihaela Diana Oancea Negescu, Maria Loredana Popescu, Raluca Iuliana Georgescu	The tension between sustainable development and resource depletion, demographic evolution and food security
sciforum-030481	Dina Maria Ribeiro Mateus, Henrique Joaquim de Oliveira Pinho	The use of reclaimed water treated by constructed wetlands filled with solid waste for irrigation
sciforum-034017	Youssef Brouziyne, Abdelghani Chehbouni	Toward better preparedness of Mediterranean cropping systems to future climate change-induced droughts, study case of a North-African watershed
sciforum-034278	Luciana D. de Oliveira, Virgílio José Strasburg, Martine E. K. Hagen, Vanuska L. da Silva, Alessandro O. Rios	Traditional Foods: consumption and valorization
sciforum-031369	Kulwa Furahisha Miraji, Edoardo Capuano, Anita Linnemann	Utilization of traditionally processed immature rice-based product, to enhance food and nutrition security in Tanzania
sciforum-034364	v Natalie Marinho Dantas, Diôgo Vale, Camila Valdejane Silva de Souza, Maria Hatjiathanassiadou, Larissa Mont'Alverne Juca Seabra	Water Footprint of Brazilian adolescents' diet according to the frequency in fast food restaurants
sciforum-034420	Natalie Stryamets, Giulia Mattalia, Renata Sõukand	Wild food for food security? Cases from Bukovina Romania and Ukraine
sciforum-034197	Fojan Agahi, Cristina Juan, Ana Juan-Garcia	Zearalenone metabolites and Beauvericin mycotoxins on SH-SY5Y cells: study of oxidative stress and genes involved in apoptosis and estrogen receptors.

Transport & Mobility Poster Session

Sciforum ID	Authors	Poster Title
sciforum-033714	Gabriel Gomes de Oliveira	Evaluation of Public Transport since an Ergonomic Perspective through the data collection, on a local line Barão Geraldo / Campinas
sciforum-034314	Tsutomu Tsuboi	Transportation analysis in India based on real traffic flow bid data and some proposal
sciforum-032233	Eduardo Jr Leron	Utilization of Waste Rubber Tires as Geocell Reinforcement
sciforum-033548	Miren Aurkene Alzua Sorzabal, Marina Abad Galtzakorta, Pedro Bravo, Igor Calzada, Rebecca Finkel, Majella Sweeney, Julie Wilson, Inaki Irazabalbeitia, Ignasi Centelles	Transforming Tourism - Regional perspectives on a global phenomenon
sciforum-033660	Margarita Martínez-Díaz	Travel time information: spatial-temporal evolution
sciforum-033707	Md Saiful Arif Khan, Andrew Sullivan, Virginia Sisiopiku	Traffic Impacts Assessment for a Major Road Construction Project in Birmingham, Alabama
sciforum-033724	Md. Hossain	Finding the Challenges for Upgrading Multi- Level of Public and Freight Transportation in a CBD Area: A Case of Railway Station Area, Khulna
sciforum-033827	Md Saiful Arif Khan, Golam Kabir	Experts Involvement for Sustainable Transportation Infrastructure Management: A Systematic Framework
sciforum-034155	Praveen Kumar	Renewable Syn gas for transport and mobility
sciforum-034257	Bibigul Amanzholova, Elena Khomenko, Natalia Fribus	Measuring the strategic disclosure: a case-study in transport sector
sciforum-034325	Juliette Tempia, Meilan Jiang, Hitomi Sato, Ghasak Mothafer, Toshiyuki Yamamoto	Risk factor analysis on bicycle accidents at intersections considering intersections' geometric features and bicycle road
sciforum-034409	Agata Kosieradzka-Federczyk, Wojciech Federczyk	Support for the development of local extra-urban transport in a view of SDG 9 in Poland
sciforum-033506	Prof. Dr. Hamid Doost Mohammadian	Comprehensive Urban Plan and Mobility Risk Mitigation for Transforming to Blue-Green Sustainable Mobility to create Modern Livable Urban Setting (Case: Global, Europe and Iran)
sciforum-033504	Prof. Dr. Hamid Doost Mohammadian	Sustainable clean mobility and urban planning - responses to sustainable development in social responsibility as a readiness for facing tomorrow's world crises

The complete list of posters'abstracts can be read in the full online version at https://wsf-8.sciforum.net/

sciforum

What is Sciforum?

Sciforum is an event planning platform that supports open science by offering the opportunity to host and participate in academic conferences. It provides an environment for scholarly exchange, discussion of topics of current interest, building of networks and establishing collaborations.

The Benefits of Sciforum

Sciforum helps conference organizers to run online and physical conferences efficiently. The organizers reduce their administrative efforts thanks to an online tool that supports all aspects of conference organization, including setting up and maintaining the conference website, managing the peer-review process, publishing the conference proceedings, handling and coordinating the conference schedule, registration, billing, sponsors, etc.

We are here to help you to

- Set up your conference website
- Handle abstract & full paper submission and peer review
- Handle online registrations and billing
- Build your conference program & schedule, record the conference income & expenses
- Build customized mailing lists
- Have access to useful data from your conference (participants list, registration details, book of abstracts, etc.)
- Copy-edit, manage & publish your conference proceedings
- Manage Awards & post event surveys

For more information, please visit: **www.sciforum.net**

For any queries, please contact: **info@sciforum.net**

Abstracts

Session 1. Food Security and Agriculture

Sciforum-034029: Addressing food supply chain resilience through intelligent management of household consumption

Elliot Woolley[1], Aicha Jellil[1], Alessandro Simeone[2]

[1] Loughborough University

[2] Shantou University

Food waste and its environmental impact is one of the largest challenges facing humankind. Roughly one third (1.3 billion tonnes) of food grown in the field never enters anybody's mouth [1]. Since the food supply chain is responsible for 26% of global anthropogenic GHG emissions (13.7 billion tonnes) [2], the environmental incentive to reduce food waste is significant. The food waste with the highest impact is that of household food waste (HFW) since it has been through the full supply chain. HFW is most closely associated with developed countries where reasons for its generation stem from poor planning of meals and purchases, difficulties in stock management, and the underlying affordability of wasting food.

In this research a product service system (PSS) has been developed to provide an opportunity to better incorporate consumers into the food supply chain and thus reduce HFW whilst enabling better supply and demand management. The proposed PSS, delivered partially through an interactive application, enables better planning of meals and the required ingredients, simple on-line purchasing and inventory management (to consume food before it expires). A core feature is a recipe suggestion tool, which identifies suitable recipes based on, amongst other criteria, existing ingredients (in the cupboard or fridge), dietary requirements and personal preferences. The artificial intelligence driven system automatically matches suitable recipes from a database using machine learning to provide a new shopping list. Consumer purchases are hence more predictable and data about consumption habits (not just purchase habits) more readily available. This enables fluctuation in food supply to be better managed – surpluses and shortages of particular crops could be addressed by respectively prioritising or reducing recipes which use those ingredients. Such a system thus allows opportunities to improve food supply security and resilience whilst also reducing HFW.

[1] IMechE, 2013. Global Food Waste Not, Want Not, Institute of Mechanical Engineers, London.

[2] Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987-992.

Sciforum-034242: Sustainable Entrepreneurship in Agribusiness: The Case of an Agro-industrial Cooperative

Daiane Johann, Carlos Ramoa

[1] Univali

Agribusiness and the technologies used in production are of great importance for human development and for Brazil. The contribution of this sector to the national GDP is relevant considering that, according to the UN, the world population remains in the process of growth, just as it occurs in Brazil, according to the IBGE. The increase in the world population directly reflects on food consumption and the search for a better quality of life. As a result, the green food production process stands out, that is, sustainable enterprises that adopt production actions based on socio-environmental development. This scenario demands a parsimonious analysis of the current development model, which focuses on the quantitative growth of the economy, while desiring qualitatively sustainable development, which contemplates converging the three dimensions of sustainability: social, environmental and economic. Studies on social entrepreneurship (ZAHRA et al., 2009) and environmental entrepreneurship (SCHAPER, 2002), are considered as precursors of sustainable entrepreneurship (HOCKERTS; WUSTENHAGEN, 2010), in this sense, this study aims to identify environmental sustainability practices, in an agro-industrial cooperative and analyze how sustainable entrepreneurship is transforming the lives of families and the space where they operate. To this end, a case study research, exploratory and descriptive, with a qualitative approach, was carried out in an agro-industrial cooperative in Rio Grande do Sul (Brazil). Data collection was carried out in July 2020, through a semi-structured interview with the coordinator of the Environmental Management area. The validation and reliability of the data occurred through the strategy of data triangulation and content analysis. The results showed that, in addition to generating sustainable value for the cooperative, the cooperative maintains permanent actions for the development of the communities in which it operates, with an effective role in environmental education and in the search for eco-efficiency in the field.

Sciforum-034482: Causes of food waste and practices for mitigation: evidence from Brazilian supermarkets and suppliers

Andrea Lago Da Silva[1], Camila Colombo De Moraes[2]

[1] Department of Industrial Engineering, Federal University of Sao Carlos, Sao Carlos, Brazil Via Washington Luis, km.235, cp.676 CEP: 13565-905 São Carlos, SP, Brasil (+55) 16-3351-9502 deialago@ufscar.br

[2] Industrial Engenieering Departament/UFSCar

There is a wide consensus that food waste needs to be avoided along the whole food supply chain, given its environmental, social, and economic impacts. In the context, retail has been considered the center of the modern food system exerting a significant influence on food waste throughout the chain, both for their supplumers. In this vein, we identify in this study how the supplier-retailer interface has dealt with the causes of FLW (specifically fruits and vegetable waste) and practices for their mitigation in Brazil. To do so, a study was conducted in four large Brazilian retailer chains. 47 interviews were conducted with retail employees, their suppliers, and specialists in the subject and sector. To complement the analysis, secondary data and direct observations were used. Regarding the causes found, some are affected due to the Brazilian consumer culture, such as squeezing food at the time of purchase and requiring a perfect aesthetic appearance and abundance of food in stores. The price and marketing actions of supermarkets can generate a fight for prices and win over consumers, causing excess food and waste. Legislative aspects and lack of government incentives influence the adoption of practices as they impose restrictions that make it difficult to reduce FLW in Brazil. The practices analyzed are, for the most part, focused on the supermarket's internal operations, and are not reflected for other members of the chain, such as suppliers. Furthermore, the practices highlighted in developed country studies differ in some aspects from the Brazilian reality. Some examples can be given. It was identified that the use of food in stores and donations are not yet frequent, due to the lack of infrastructure and government incentives, and also depend on the corporate responsibility of the supermarket. Composting and energy recovery are just projects, due to its high investment cost. Employee training and awareness is not extended from the supermarket to its suppliers. Information sharing and collaboration practices are limited and reactive. Besides that, practices related to packaging and technology are little used due to their cost of adoption in Brazil. The findings of this study can help Brazilian managers to identify the causes of FLW in their operations, as well as to analyze the best mitigation practices according to the particularities of each organization such as cultural aspects and consumer preference, competition, location, infrastructure and size of stores and distribution center, access to food from suppliers in various regions of the country and power of the supermarket in the chain. Also, we can consider coordination and collaboration between suppliers (producers and wholesalers) and supermarkets.

Sciforum-032120: Effectiveness of awareness campaigns in shifting practices to reduce household food waste

Belinda Li[1], Virginia Maclaren[2], Tammara Soma[1]

[1] Simon Fraser University

[2] University of Toronto

In industrialized nations, approximately one-third to one-half of food waste comes from the consumer (household) level. Shifts in household food-related practices to reduce food waste are therefore crucial to achieve Sustainable Development Goal Target 12.3 of halving per capita global food waste at the retail and consumer levels. In this study, we compared the efficacy of three types of awareness campaigns in changing household food-related practices that are associated with reducing food waste. The three groups were: a passive approach (informational brochures), a community workshop approach, and a gamification approach. There were 501 participants recruited for this study from different neighbourhoods in the City of Toronto. Participants were divided into the three campaign groups and one control group. Before and after the 12-week campaign, participants answered a survey on household food-related practices. A subset of participants took part in focus groups after the campaign.

Overall, there were few changes to shopping practices, management of leftover food, and food waste disposal practices at the end of the campaign. Some changes were observed for the gamification group on how best before dates were managed. The gamification group threw away food past its best before date less frequently ($p=0.04$), checked if food past its best before date was good to eat more frequently ($p=0.01$), and ate food past the best before date more frequently ($p=0.04$). They also reported more food waste reduction ($p = 0.03$) than other groups. Additional analysis on the gamification group was conducted on socio-demographic factors that may affect participation. Households without children engaged with the online game more than those with children ($p=0.04$). This study demonstrates the potential for gamification as a strategy to shift household practices to reduce food waste.

Sciforum-031651: Why it is not that easy to apply nudges to stimulate sustainable food choices out-of-home – Insights from real-world experiments

Pascal Ohlhausen[1], Nina Langen[1], Fara Steinmeier[2], Silke Friedrich[2], Tobias Engelmann[2], Melanie Speck[3], Petra Teitscheid[2]

[1] Institute of Vocational Education and Work Studies, Department Education for Sustainable Nutrition and Food Science, Technische Universität Berlin, 10587 Berlin, Germany

[2] Institute of Sustainable Nutrition, University of Applied Sciences Münster, 48149 Münster, Germany

[3] Wuppertal Institute for Climate, Environment and Energy, 42103 Wuppertal, Germany

One of the biggest drivers to achieve the Sustainable Development Goals by 2030 is the global food system (Black, 2013). Current data estimates its worldwide impact on greenhouse gas emissions at around 26 percent (Poore and Nemecek, 2018). After the retail sector, the out-of-home catering sector is the second biggest food sales channel in Germany (BVE, 2019). Building on the challenging results by Nahgast 1, described in Ohlhausen et al. (2018), illustrating that there is no most appropriate nudge over all out-of-home settings, Nahgast 2 again investigates different type 1 and type 2 nudging interventions in harmonized but real world settings (business canteen and university canteen). Between autumn 2019 and summer 2020, three canteens promoted the most sustainable dish of the day with different nudges focusing on (i) choice-architecture via best counter positions and top menu positions (Campbell-Arvai et al., 2014; Dayan and Bar-Hillel, 2011; Hanks et al., 2012; Just and Wansink, 2009; Levy et al., 2012; Ohlhausen et al., 2018) and (ii) nutrition and sustainability information via labels (Grunert and Wills, 2007; Miller and Cassady, 2015). To compare the nudge interventions, a harmonized menu plan across the canteens was introduced and optimized using the Nahgast tool to assess the sustainability of a dish. Besides, two zero-measurements were carried out in each canteen to serve as baseline data. To avoid menu monotony between the intervention weeks, cooling-off periods of at least four weeks were implemented.

First results reveal, that in general, all tested nudging variants can be used to boost sustainable meal choice. This is different to the findings of Ohlhausen et al. (2018). Regarding the single settings, results vary between nudging interventions as well as between the sustainable dish variants. Thus, the nudges tested in our real-world experiments are helpful additions to promote the most sustainable dishes of the day. Nevertheless, the finding that nudges have to be implemented and monitored setting specifically, situation specifically and dish specifically to provide the most impact remains.

Sciforum-032248: A nexus approach to study the sustainability of social-ecological systems: implications for SDG governance

Mario Giampietro[1, 2], Juan José Cadillo-Benalcazar[1], Ansel Renner[1]

[1] Universitat Autònoma de Barcelona

[2] Institució Catalana de Recerca i Estudis Avançats (ICREA)

Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism is a novel transdisciplinary and multiscale mode of analysis grounded in complex systems theory. It has been conceived to structure the perceptions (qualitative pre-analytical choices) and representations (quantitative analytical choices) of sustainability predicaments in relation to, respectively, the prioritization of existing concerns and the constraints associated with the resource nexus (water, energy, food, land uses, human activity). Through the use of relational analysis, MuSIASEM describes processes across different hierarchical levels and dimensions of analysis, thus preserving coherence across indicators based on different metrics. Concretely, the quantitative contextualization of narratives about water, energy and food security in relation to different sustainability concerns is based on an integrated analysis of the relations between: (i) the pattern of internal consumption (desirability); (ii) the degree of commercial openness (trade); (iii) the requirement of human-controlled resources (land uses, irrigation water, fertilizers, pesticides, etc.) for both local production and implied in imports (assessed as virtual quantities embodied in imports); (iv) the environmental pressures both locally exerted and externalized through imports (assessed as virtual quantities embodied in imports).

Applications of MuSIASEM to EU food, water and energy security have been tested in the Horizon2020 project 'Moving towards Adaptive Governance in Complexity: Informing nexus security' (MAGIC). Results show, among other things, that the EU is heavily dependent on animal feed imports and could not possibly internalize their production. The tension between high agricultural productivity and environmental protection in the EU is 'resolved' through the externalization of environmental pressures. Hence, EU food security is tightly linked to the food and environmental security of the rest of the world. This novel approach avoids the insurgence of the 'silo-governance syndrome' and underlines the need to address the UN Sustainable Development Goals as a complex whole, rather than one at the time.

Sciforum-029252: A proposal of a mixed multi-criteria model to the priorization of ecosystem services in protected areas

Mónica de Castro-Pardo, Victor Martin Barroso, Pascual Fernández Martínez

[1] URJC

Land use change is occurring worldwide and is impacting on the delivery of multiple ecosystem services. For this reason, the assessment of ecosystem services today is more important than ever. However, there remains a substantial gap between the large amount of information available about ecosystem services and the information required to support decisions and this undermines the efficiency of their management. Multi-criteria analysis techniques can be very useful to efficiently develop decision-making processes to properly channel investment and optimize the costs associated with conservation. In this study we applied a multi-criteria method that allowed to assign priorities to 20 ecosystem services in Ordesa and Monte Perdido National Park (Spain) in terms of the importance and vulnerability. The preferences of a group of experts involved in the management of the National Park were collected using an AHP survey. After that, the inconsistent responses were dealt using a Goal Programming model, before obtaining the global result. Finally, a Joint Relevance Index (JRI) was used, which presents the relative importance of each service in an aggregated way. The results show that conservation policies should be primarily directed towards lifecycle maintenance and water conditions. Depending on the vulnerability of the services, conservation policies should be channeled towards provisioning services related to wild animals and wild plants. Regarding the relative importance of services in this site, priority should be oriented to lifecycle maintenance, water conditions and intellectual interaction with the environment. The proposed model was efficient when recovering lost information, helping to avoid the distortion of the final prioritization and providing aggregate results following vulnerability and ecological value criteria.

Sciforum-031349: A Study on Livelihood System of Oil Palm Farming Households under the pressure of Land-Tenure Insecurity in Jambi Province, Sumatra, Indonesia

Audina Amanda Prameswari[1, 2], Masatoshi Sasaoka[1], Arya Hadi Dharmawan[2]

[1] Graduate School of Human Sciences and Humanities, Hokkaido University, Japan

[2] Department of Communication and Community Development Sciences, Bogor Agricultural University, Indonesia

The development of oil palm in Indonesia had turned out to be a world concern. Well-known as a major contributor to global production, Indonesia had done a great land conversion from forest to oil palm plantation to fulfill the global demand. This promoted deforestation as well as biodiversity loss which resulted in a boycott from the European Union due to its unsustainable practice in producing oil palm. Therefore, oil palm producers are obliged to certify their oil palm production under sustainable certification schemes. However, this commitment turns difficult to be implemented since there were many independent smallholders have lived in conservation area without having one of the crucial requirements, land certification, which had brought them into an inconvenient way of living. This inspires the authors to understand the livelihood systems of oil palm smallholders that had been living under the pressure of land-tenure insecurity for such a long period.

Sultan Thaha Syaifuddin Conservation Area which located in Jambi Province was chosen to be our research location. By considering the primary forest that had only left around 15.66%, this conservation area is currently in a critical situation as the area is mostly covered by oil palm plantation. Thus, understanding the livelihood systems of oil palm smallholders is the approach that authors have done to construct a further policy recommendation. The research combines quantitative and qualitative methodology, where questionnaires were distributed to collect socio-economics data, while in-depth interviews were beneficial for understanding their livelihood pressure. The result shows that the conservation area was occupied by oil palm smallholders with two different type of livelihood system which both threatened the sustainability of the forest area. If these livelihood systems continued, the nature would be unabatedly degraded and the 15th goal to promote sustainable use of terrestrial ecosystems would never be attained.

Sciforum-036249: Novel technologies for real-time solutions in a transformed food system

Lise Korsten

[1] Co-Director, DSI-NRF Centre of Excellence in Food Security, University of Pretoria

Fruit production and international trade represent key agricultural sectors in many African economies, yet few are food secure. The COVID-19 pandemic clearly articulated the bottlenecks in global trade with ports being closed and food flows being disrupted. Food sovereignty is clearly a critical element in regional food systems and should be included in the discussions regarding sustainable climate-smart agriculture. Linking farmers directly to markets and shortening the supply chains has clear advantages already absorbed in Slow Food and Buy Local. Climate-smart agriculture provides access to technologies that can fuse into the circular economy. One example where a transformed food system can be an enabler for rural economies include open source data acquisition systems. Quality, nutritional value, safety, and freshness is directly dependent on the postharvest handling and journey from the tree to the plate. Extensive stresses on the fruit during harvest, packing and transit as well as cold chain interruptions can contribute to market end losses and waste. A recently developed low cost, stand-alone, open-source data system (SmartFruit) linked real-time field environmental data during production with quality measurements, market requirements, and trade flow systems. The miniaturized Arduino sensor platform is enclosed within a waterproof enclosure and surrounded by a 3D printed shell manufactured from morphologically compatible materials. The platform can monitor agricultural processing facilities and transportation networks and provide buyers real-time information regarding quality, quantity, and product flows. This is one example of novel technologies that can enable farmers to link directly with markets and for buyers to virtually follow the journey from farm to market.

Sciforum-034225: Analyzing the critical effect of business logistics performance on food security and agriculture

Eliseo Vilalta-Perdomo[1], Rosario Michel-Villarreal[2]

[1] Aston Business School; Aston University

[2] School of Agriculture, Food and Environment; Royal Agricultural University

This presentation provides an analysis of the importance of increasing countries' logistics performance to achieve levels of zero hunger. Regional and global analyses are done to identify possible impact of nations' logistics performance in achieving the sustainable development goal 2.

Data from the Logistics Performance Index is provided by the World Bank and consists of six core components: a) the efficiency of customs and border clearance; b) the quality of trade and transport infrastructure; c) the ease of arranging competitively priced shipments; d) the competence and quality of logistics services; e) the ability to track and trace consignments, and f) the frequency with which shipments reach consignees within scheduled or expected delivery times). Data concerning the SDG 2 is collected by the United Nations and it considers the following indicators: a) prevalence of undernourishment; b) prevalence of stunting (low height-for-age) in children under 5 years of age; c) prevalence of wasting in children under 5 years of age; d) prevalence of obesity, BMI ≥ 30; e) cereal yield (t/ha), and f) sustainable nitrogen management index.

The regression model developed in this study suggests a high degree of correlation between LPI and SDG 2. Overall, the regression model suggests that the LPI components predict the SDG 2 indicator significantly well.

The relevance of this study lies in the fact that no country is in track to achieve all the SDGs. To achieve all the SDGs requires deep transformations of education systems, healthcare, energy use, land use, urban planning, and deployment of information technologies. In the case of SDG 2 (Zero Hunger), as logistics is embedded within many of our systems, changes in logistics performance seem pertinent to achieve the SDG 2 globally.

Sciforum-034517: Challenges and opportunities of Food Loss and Waste Action for Latin America

Felicitas Schneider

[1] Johann Heinrich von Thünen Institute of Market Analysis

Wastage of food is an economic, environmental and social problem and is addressed by Sustainable Development Goal 12.3 globally. Aim is to halve food waste at the retail and consumer levels per capita until 2030 and to reduce significantly food loss along the supply chain. One third of all food produced is going to waste globally which means 127 million tonnes of food in Latin America each year. Especially fruits and vegetables, root crops and tubers as well as fish and shellfish are affected mostly. Challenges to overcome are e.g. poor infrastructure and stakeholders´ change of behaviour.

In 2015 under lead of FAO LAC regional office, the Regional Alliance for the Prevention and Reduction of Food Losses and Waste (FLW) was established, requesting the formation of National Committees for coordination of action against FLW. Among others, Argentina, Brazil and Chile installed National Committees and strategies for tackling FLW successfully. In 2015, the Meeting of Agricultural Chief Scientists of G20 (MACS-G20) initiated the Collaboration Initiative Food Losses and Wastes on a global scale. One activity is to organize annual regional workshops in order to facilitate regional networks and cooperation. In the course of the Argentinian G20 presidency in 2018, the MACS-G20 FLW workshop presented the 4th Regional Dialogue on FLW in Buenos Aires where the "Call to Buenos Aires Action on FLW" was signed by important stakeholders. The cooperation was also starting point of the proposal towards the "International Day of Awareness of Food Loss and Waste" which was designated by United Nations general assembly in 2019 and will be celebrated on September 29th, 2020 for the first time. Opportunities include the harmonization of strategies against FLW, food and nutritional security as well as the eradication of hunger in LAC countries and to establish joint action among stakeholders.

sciforum-033622: Cities as Transnational Actors in the Resilience of Food Systems: A Gender Perspective

Kareem Buyana

[1] Makerere University, Uganda. Department of Geography, Geo-informatics and Climatic Sciences.

Globally, the need for food systems that can absorb or recover from the effects of hazardous events, is increasingly becoming paramount. However, most of the available literature on the role of cities in enhancing the resilience of food systems is unclear on the pathways that can bring about the twin sustainability imperatives of gender equality and food system resilience. This paper draws on literature and interview data from four city regions in Africa to discern how gender dynamics are shaped and differentiated across crop value chains that bear opportunities for resilient city region food systems. The four city regions are: Arba Minch-Ethiopia, Kigali-Rwanda, Bukavu-Democratic Republic of Congo and Msunduzi-South Africa. Although production of food is pre-dominantly a women's occupation, the research revealed that women's participation in the latter stages of value chains, particularly processing and marketing is minimal, while the diffusion of knowledge and technologies for coping with climatic and economic shocks may produce desirable effects for one gender sub-group, while generating negative spill-overs for others. This is because incentives to utilize knowledge and technologies in production, processing and marketing food products, differ on account of gender-based differences in labor remuneration, control over farm land and proceeds from harvest, coupled with the breadth of social networks within and beyond the city region. If cities are to be at the frontline of building resilient food systems, collaborations amongst farmers, policy-makers and actors situated between producers and consumers, need to create spaces that enable different gender cohorts have their voices heard and count in the decisions made around the up-take of knowledge and technologies. The greening and automation of value chain activities also needs to be locally embedded, i.e. harness local knowledge from women farmers and rely on the use of local materials in the design, replacement and mantainence of technologies.

Sciforum-034219: Communicate about food and health at the pandemic time

Mariella Nocenzi[1], Barbara Di Giovanni[2], Ombretta Presenti[3], Claudia Zoani[4]

[1] Sapienza University of Rome – Dept. of Communication and social Research

[2] Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) - Dept. for Sustainability - Section Technical and Strategic Support (SSPT-STS)

[3] ENEA- Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) - Dept. for Sustainability - Biotechnology and Agroindustry Division- Biotechnology Laboratory (SSPT-BIOAG-BIOTEC) – (SSPT-BIOAG)

[4] Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) - Dept. for Sustainability - Biotechnology and Agroindustry Division (SSPT-BIOAG) – METROFOOD-RI Coordinator

The health emergency is inducing transformations that require social research to measure change theories with the dynamics of the first global pandemic.

This paper aims at reviewing the pandemic social change focusing on one of the main social domains, communication. It is actually facing the most complex challenge ever. It has been called “infodemic” for the dissemination of an enormous amount of information from different and often unverifiable sources. News spreads quickly and through multiple channels. The "information contagion" makes the management of the emergency much more complex as it undermines the transmission of clear and unambiguous instructions. Social research can supply knowledge to make the consequences of the virus on society less opaque. A strategic aspect is the change in languages and discursive practices among science, politics, and public opinion.

A useful case study is the research infrastructure METROFOOD-RI - Infrastructure for Promoting Metrology in Food and Nutrition (www.metrofood.eu) and its freely accessible information service implemented during the health emergency. A dedicated website includes organized and constantly updated official information, scientific publications, risk assessments and monitoring results, scientific cooperation initiatives, guidelines and good practices on the links between Food & COVID-19, considering the entire food chain, from primary production to final consumption. The info-collection is organized in two sections, specifically addressed to different user categories: *Research, Inspection & Control* and *Production & Consumption*.

METROFOOD-RI recalls a short-term participatory tool according to the *citizen science* form. It plays a social, scientific, educational and political role, , promoting greater public transparency and data accessibility in research project’s decisions and processes by reducing discrimination of those who do not have access to scientific channels and verify the truthfulness of the news. Incorrect communication creates dissonances, dissonances create panic, and panic often generates counterproductive reactions and behaviors.

Sciforum-031270: Contribution of commercialised food systems to smallholder household income and food security. A case of north-west Mount Kenya region

Emily Mutea[1, 2], Stephan Rist[2, 3, 4], Johanna Jacobi[3, 5]

[1] Institute of Geography, University of Bern

[2] Centre for Development and Environment, University of Bern

[3] Institute of Geography, University of Bern

[4] UNESCO Chair on Cultural and Natural Heritage and Sustainable Mountain Development, University of Bern

[5] Centre for Development and Environment, University of Bern,

Rural areas of Sub-Saharan Africa are widely categorized as an agrarian economy. The ironic paradox is that the majority of these food producers are themselves hungry and poor. Despite their key role in feeding the growing population, smallholders especially in Kenya still produce under agricultural systems characterized by low external inputs and assumingly low outputs. Many scholars and policy makers therefore propose to transform smallholder farmers – generally involved in a diversified mix of subsistence and occasional market-orientation - towards higher levels of commercialization in relation to input provision, production and consumption systems. This is seen as part of "virtuous cycle" leading to improved income and food security. However, empirical research that evaluates the positive impacts of commercialization on food security is still scarce and contradictory. Using data from 76 households - 38 food secure and 38 food insecure households - sub sampled from a previous food security survey of 380 households, we aim to assess whether transformation from semi-subsistence farming systems into other more commercialized food systems have any positive impact on household food security. Overall, shifting to more commercialized food systems tends to raise household income, but does not always result in household food security. Households establish linkages with more commercialized food systems through sale of produce and labour that fetch a relatively higher price. However, some of these households still spend a large share of the income earned from more commercialized food systems to finance the production. Additionally, households producing for commercialized food systems tend to sell a substantial amount of their produce more often immediately after harvest when prices are lowest. On one hand, this results to low profits, no profits or even losses especially for full time farmers. On the other hand, smallholders end up buying food at consumer price which is always relatively higher than farm gate prices and this make them vulnerable to food insecurity.

Sciforum-032278: Digital Based Model for Improving Agricultural Productivity in Africa

Dorcas Shumba

[1] Davar Resources, Zimbabwe

Digital technologies have been observed to make positive contributions towards boosting productivity, profitability and resilience to climate change. It is further believed that an inclusive, digitally enabled agricultural transformation could help achieve meaningful livelihood improvements for Africa's 250 million smallholder farmers, however many African countries are lagging behind in digital literacy. African countries have prioritised agricultural transformation as a key pillar of their national strategies. Yet, as the African Union's 2018 biennial review of the Malabo Declaration shows, fewer than half of countries (20 out of 47) are currently on track to meet their commitments by 2025. This study proposes a digital based model to assist African governments to precisely capture digital data from natural farming regions, individual farms and fields, and combine it in macro-level data sets which will be used for Decision Making. The model called, Precision for Decision Making (P4D) is an agricultural management system that will be tested first in Zimbabwe. The P4D will be enabled by a broad range of digital technologies (e.g. precision agriculture, the Internet of Things (IoT), digital monitoring systems, cloud computing) and supported by accumulated knowledge arising from research and development and scientific endeavour.

At its very core, the P4D is designed to provide precise/specific data for decision making which will be carried out on three interfaces, that is, spatial interface, crop interface and human interface. The spatial interface generates geospatial data through precision mapping to produce agro-climate and soil specific data. The crop interface generates crop specific data from the pre-crop stage to harvest stage, and also computes farm inputs required for crop growth (e.g. seeds, fertilisers, pesticides and herbicides). Lastly, the human interface generates farmer specific data matching this with finance specific data relevant to the farmer profile. The human interface is particularly important to the P4D as it presents governments with an opportunity to create digital farmer profiles. There is a growing focus on the importance of digital farmer profiles given their potential to eliminate one of the bottlenecks for provision of more targeted services to farmers. The digital based model with thus provide governments and farmers with access to tailored information and insights that allow individuals to optimise their production, gain access to appropriate products and services, and explore new linkages with markets.

Sciforum-029330: Drivers of Accelerated Institutional Change Toward Sustainable Viticulture in Bordeaux

Tatiana Bouzdine Chameeva[1], Sanjay Sharma[2], Joerg Hofstetter[3]

[1] Professor, Kedge Business School, France

[2] Dean and Professor, Grossman School of Business, Univ of Vermont USA

[3] Assistant Professor, Kedge Business School, France

The slow progress in achieving the UN Sustainable Development Goals has escalated concerns about the speed of improvement in the sustainability performance of business firms. While there are examples of a few leading firms in each industry sector that have exhibited a proactive transition towards sustainable business practices, most firms have not made substantial changes in their practices. As various stakeholders call for stricter regulations to coerce businesses into adopting the UN SDGs, firms have sometimes countered these calls by establishing voluntary sector-level initiatives.

Our study was motivated by a sudden increase in speed at which four St.-Emilion appellations (AOCs) in the Bordeaux wine region, recently adopted a mandate to produce all wine using sustainable farming methods. AOCs are voluntary initiatives, but once adopted their policy is binding for, and strictly enforced, amongst members who want to market their wines under the prestigious St.-Emilion label.

Most of the firms in the St.-Emilion AOCs are family owned. The institutional view argues that family businesses, with their historically developed and enduring family values, are usually unable to cope with fast institutional changes, while non-family firms, with few enduring identity based shared values, can adapt more easily (Banalieva, Eddleston & Zellweger, 2015). On the other hand, the family businesses are more likely to invest with a longer-term perspective as compared to non-family firms, enabling them to make more profound changes (Sharma & Sharma, 2019).

Our study found that in the Bordeaux wine region, the traditional values of family firms are more easily aligned with sustainable viticulture and viniculture. Families that live and work on the land, experience environmental impacts firsthand. They are also conscious of their environmental stewardship mission for the land and natural resources and are embedded in their local communities. Our results suggest that family firms are driven by family, community and market logics in adopting sustainable practices as compared to non-family firms whose decision-making is may be more likely to be driven by a market logic alone. Our study suggests that in contradiction to the extant literature on institutional change, family firms, whose values align with sustainability, can succeed as institutional entrepreneurs in affecting speedy system wide change toward proactive sustainable practices in an industry or region. The paper addresses in particular SDGs 3, 8, 12, 13, and 17.

Sciforum-036555: Multi-stakeholder initiative for FLW mitigation

Luciana Marques Vieira

[1] Departamento de Administração da Produção e Operações Industriais (POI)

This paper aims to investigate the roles adopted by the distinct stakeholders that are engaged in a voluntary initiative to reduce food loss and waste (FLW) in the context of an emerging country. Data were collected by way of participant observation in multi-stakeholder events, observation visits and interviews with 54 food sector stakeholders in Brazil, and from secondary data. The theoretical contribution of this paper is that it provides a systemic and realistic perspective for tackling FLW, as research in the field usually only focuses on one supply chain agent, or on consumer behaviour. Another contribution that may be replicated in other countries has to do with the role of each stakeholder in identifying the processes with which they are involved for reducing FLW. Activities and actions in a multi-stakeholder initiative change according to their positioning at the institutional or value chain level of analysis. Future studies should consider the extensive interplay that exists between the institutional and value chain levels in the food sector, and how they interact.

Sciforum-034475: Entrepreneurship opportunities for FLW mitigation

Daniele Eckert Matzembacher, Marcia Dutra de Barcellos

[1] Federal University of Rio Grande do Sul (UFRGS)

Food loss and waste (FLW) solutions are a new frontier for sustainable food systems. It is one of the most promising measures for improving food security in the coming decades and one of the prominent goals in the current research in the food and managerial sector. Many countries are already taking action to reduce FLW, but the challenges ahead remain significant and we need to step up efforts involving the most diverse stakeholders in society. The private sector, as the main driver of economic activity and important source of creativity, innovation and entrepreneurship, should be involved in the attempt to achieve greater sustainability, proposing solutions to address FLW issues. Empirically it is possible to identify the emergence of first movers, entrepreneurs bringing new organizations forms that propose to address the problem of FLW, combining characteristics of entrepreneurship in the food industry with strong influence by the use of technology. These new organizational forms are identified as sustainable entrepreneurship, since, in addition to profit, they aim to generate environmental and social benefits through its commercial activity. These entrepreneurs set up a business that is expected to positively influence consumer behavior, retail actions, distribution and marketing actions, and perhaps government actions. The objective is to contribute to the debate about agency into institutional theory, since it helps to explain how the agency of these first movers, i.e., what motives them to make such enterprises, their business models, what mechanisms they use to modify the institutional environment, and how these entrepreneurs produce positive social impact. The understanding related to how institutional entrepreneurship works might enable potential change related to constraints in the institutional environment and solutions to challenges faced by society, as it is the case of FLW solutions.

Sciforum-031288: Farmers' perceptions and the potential of participatory guarantee systems in Bolivia for sustainable trade and diversified food systems

Johanna Jacobi

[1] Centre for Development and Environment, University of Bern

Certification for eco-friendly and fair food production and trade is increasingly discussed and applied. Participatory guarantee systems (PGS) are alternative, community-organized certification mechanisms for organic or other differentiated quality products. PGS-like systems have developed in many different contexts simultaneously and comprise over 311 000 farmers in 66 countries. PGS are organized locally, e.g. by producers' organizations, or by producer-consumer networks. There are many different forms of PGS, but they share: 1) standards and norms; 2) seals and labels; 3) documented management procedures; 4) pledges; 5) defined consequences for non-compliance; and 6) mechanisms to verify producer compliance. Research has shown stronger positive impacts on health and the environment than with other types of certification. PGS can link producers and consumers in a more accessible and inclusive way than third-party certification. They can provide an alternative approach to sustainability governance, which is more democratic, territorial-based and imply social and local benefits that go further than organic certification. However, PGS are often threatened by national legislation and are not recognized internationally, and therefore so far mainly used for local to national markets. Bolivia is second worldwide in terms of PGS-certified farmers, and has a national legal framework for PGS. In the frame of an interdisciplinary research project ("Sustainable Trade for Diversified food Systems"), this research investigates possibilities for including PGS-certified Bolivian food products in international trade. Data from four different PGS groups in four different climatic zones in Bolivia shows products, sales, and farmers' views on possibilities of linking their value chains with export markets. Trade expert interviews provide insights on experiences and the potential of PGS in being recognized and used in international trade for greater accessibility for smallholder farmers and diversified sustainable and fair food products.

Sciforum-033777: Achieving Food Security in the Post Covid-19 Era through High-Tech Vertical Indoor Farming in Densely Populated Cities

Suaad Jassem, Mohammad Razzak

[1] University of Malaya

Forecasts made by the United Nations and the World Health Organization indicates that two simultaneously occurring phenomena are likely to threaten food security especially in densely populated urban centers of the world. The first being the migration of people from rural communities to large cities to seek better economic opportunities, that are likely to put immense pressure on civic amenities in urban centers. The second is the possibility that virus-borne infectious diseases will persist for the foreseeable future until potent vaccines are developed. Furthermore, there are also possibilities that new highly infectious and deadly diseases, are likely to emerge in rapid succession. Both the above factors have exposed many weaknesses in sustainability of the food supply chain in large metropolises.

The threat to food security is particularly true for fresh products such as vegetables and fruits. The present supply chain of fresh products to densely populated cities relies on daily transportation of farm products from traditional farms either in remote rural areas or peripheries of the cities. In the wake of Covid-19, in many countries such as the United States, the farming sector was hit hard due to a shortage in farm workers, leading farmers with no option but to let their crops rot in the fields, whereas, there were supply shortages across many cities. Considering the possibility that pandemics such as Covid-19 may be a recurring phenomenon, entities in the food supply chain can no longer rely on the traditional models.

A viable solution to the above dilemma lies in high-tech vertical indoor farming. The use of advanced technologies that are applied in the context of Industry 4.0, such as hyper-connected systems through internet of things, cloud computing, artificial intelligence, robotics, etc., are making it possible to grow vegetables, some varieties of fruits and flowers in controlled indoor spaces that are close to consumption centers. These indoor farming projects rely on hydroponics, aeroponics and aquaponics that can be installed in existing buildings or in shipping containers that can be moved around to various locations.

Sciforum-034322: Financialization and food security: the effects of Covid-19 for the Latin American region

Paola Selene Vera[1], Ricardo Cristhian Morales Pelagio[1], Miguel Angel Reyna Castillo[2]

[1] Research Division of the Faculty of Accounting and Management, National Autonomous University of Mexico (FCA, UNAM)

[2] Postdoctoral researcher at the Research Division, Faculty of Accounting and Management, National Autonomous University of Mexico (FCA-UNAM).

In recent decades, food security has occupied a relevant position on the agendas of governments in Latin America (Latam), and generally, worldwide. During the Covid-19 pandemic, it has been observed that the food supply chain was not disrupted. However, its production level and costs have undergone negative impacts. Furthermore, the financialization of food implies high volatility in its prices in the financial markets due to speculation. Overall, this situation impacts food producers and marketers, generating instability in their activities. On the other hand, measures to contain the spread of the virus have led to economic contraction and bankruptcy of companies, this implies lower levels of income and employment. Our objective is to analyze the repercussions of the financialization and economic impacts of Covid-19 on food security in Latam. For this, an analytical introspection is made using statistical analysis of socioeconomic variables. It is found that this problem in supply and demand capacity puts food security at risk, not only in poor countries but also in the world's lowest-income population. Because the minimum required nutritional needs will only be guaranteed for the high-income sectors that can access food, despite the scarcity or rise in food prices.

Sciforum-034373: Food and food waste: Contradictions on the way to caring communities & implications for sustainable development

Christina Marouli

[1] Environmental Studies, Deree - The American College of Greece

Hunger persists in the contemporary world with the increasing human population. Food waste continues to be a serious problem in contemporary societies. Food quality and related health issues constitute important concerns that reflect our problematic relation with nature.

Thinking of food security for all, we should unquestionably address – aside of sustainable agricultural practices and food hygiene concerns – the issue of food waste. Discussing food security from the side of agriculture – food production and distribution alone – is in line with the present linear logic. But the circular economy concept and goal of the European Union (EU) reminds us that we should at all fronts, including food and food waste, aim to close the loop.

However, the effort to close the loop in the domain of food – food waste runs against serious contradictions at many levels: in the cultural conception of food and food waste; in the policy frameworks that regulate these; between technical and social approaches to the problem; at the administrative level which should implement relevant initiatives; as well as between perceptions and actual behaviors. These will be discussed based on lessons from actual EU – funded projects in Heraklion, Crete and elsewhere.

This work will conclude by outlining some policy implications as well as by revisiting the concept of sustainability and sustainable societies. The author proposes that present crises call us to dare move away from "soft" approaches to sustainable development and redefine it in light of natural laws urgently.

Sciforum-031798: Food waste management in retail: A regional perspective

Izabela Karolina Horoś, Tonia Ruppenthal

[1] Fulda University of Applied Sciences Department of Nutritional, Food and Consumer Studies

The aim of this paper is to examine the causes of food waste and its prevention strategies in retail in a German region from a managerial perspective. We therefore conducted a case study through semi-structured expert interviews with branch managers and applied a qualitative content analysis to the transcribed textual material. The findings show that the avoidance of food waste is an incentive for all branch managers, as it means a financial loss for them. It is further an incentive for them, as the prevention of food waste represents a social contribution to the community. The majority of food waste generated by the retailers in the region is due to spoilage and expiration dates. Food commodities that account for the highest share of food waste are fruits, vegetables, and dairy products. We identified that food waste generation can be reduced by precise planning and accurate ordering as well as by regionalization of agricultural products with direct delivery and low stocking. Furthermore, through agreements between the managers and local charities, the re-use of food can help prevent further food waste.

Sciforum-030608: From a research project to transformational change in an urban food system: findings from an inter- and transdisciplinary research collaboration

Hartmut Derler, Simon Berner, Stephan Pabst, Ulrike Seebacher, Johannes Haas

[1] FH JOANNEUM University of Applied Sciences

Continuing population growth together with challenges such as climate change and environmental degradations call for a more sustainable food provision in urban and peri-urban regions. The role of scholars and research institutions is to identify barriers that hinder and show options that promote more sustainable food systems. Transdisciplinary research approaches, which go beyond disciplines and involve the integration of practitioners into knowledge production, have been prominently discussed as a methodological approach to initiate and guide such change processes. In this regard, we provide findings from a transformational process that started with a nationally funded inter- and transdisciplinary research project. Follow-up activities led to a change of crucial elements within the target city-region food system. The project followed a participatory approach and its objective was to contribute towards a more local and resource-efficient food provision in the city of Graz, Austria. A visual roadmap helped to integrate different perspectives, establish a common vision and communicate to a broader audience. Based on findings from the process, we argue that interactions between scholars and practitioners led to the establishment of a close network of local food system agents that incrementally shaped the target food system through actions on different levels.

Sciforum-031230: From Research to Action: Participatory Transformation and Sustainability of Farmers Milk Cooperative in Agropastoral Community in Laikipia, Kenya

Stellah Mikalitsa Mukhovi[1], Boniface Kiteme[2], John Mwangi[2], Grace Wambugu[2]

[1] University of Nairobi, Department of Geography and Environmental Studies

[2] Centre for integrated Training and Research in ASAL Development (CETRAD)

The research project "Towards Food Sustainability: Reshaping the Coexistence of Different Food Systems in South America and Africa" (2015-2017) had one of its key outcomes the development of food sustainability framework (FOODSAF). The second phase (2019-2020) of the project involves implementation of Transformative Pilot Actions (TPAs) which are small projects within communities designed to bring a shift in emphasis from systems knowledge to transformation knowledge. Poor performance of the dairy value chain dominated by smallholders was found to be an area of concern at the research phase. The farmers who had been involved in the co-production of knowledge at several stages of the research were supported through a process of multi-level, multi-sectoral and multi-stakeholder negotiations to design and implement an intervention that would create change in the community. The objectives of the TPA were community mobilization, building the capacity of the cooperative members, price stabilization by constructing a cooler house and installing a milk cooling system for milk bulking and value addition and cooperative governance. Although the TPA is still ongoing, several benefits have already been observed among the cooperative members and in the community. Preliminary interviews and Focus Group Discussions have revealed the following benefits; increased membership, increased productivity, diversification of markets, improved animal husbandry, reduction in milk rejected, increased price per unit, improved breed through Artificial Insemination (AI) and improved income and food security of the members and their households. We learned several lessons; transformative actions require a strong sense of ownership by the community and its leaders, selfless commitment by members who voluntarily provide their labour, time, materials and finances for unforeseen long term benefits and its easier to achieve quick results in community that has some form of self-organisation. These lessons can help in upscaling of TPAs in similar or even different contexts.

Sciforum-030657: Geographical indication to build up resilient rural economies: a case study from Ghana

Yari Vecchio[1], Abdul-Latif Iddrisu[2], Felice Adinolfi[1], Marcello De Rosa[3]

[1] Department of Veterinary Medical Sciences, University of Bologna

[2] University of Cassino

[3] Department of Economics and Law, University of Cassino and Southern Lazio, Cassino, Italy

Geographical Indications belong to the economic concept of monopolistic competition which describes the idea of economics of product differentiation. As Rangnekar (2004) put it; *"GIs are a type of collective monopoly right.* Producers from a certain geographical area develop a reputation for quality of their products over time". Geographical indication is essential in helping consumers distinguish between premium-quality and low-end products. According to Addor et al. (2003); "trust in the geographical indication is the reason why consumers may be willing to pay a premium for products from a region".

However, due to the inability of African states to establish efficient GI policy and regulatory regimes, it has become difficult for small-scale farmers in Africa to benefit from these afore mentioned opportunities. This hinders the move of small-scale farmers from traditional markets to modern markets driven my "super-marketization". This phenomenon makes the agriculture sector (major source of livelihood for majority of Africans) less productive and unattractive. This threatens food security in the continent and becomes recipe for poverty, insecurity, and chronic diseases. This research therefore proposed the development of efficient GI regulatory and policy regimes in Africa to serve as a strategic development tool to foster local economic development and move people in the continent above the poverty line.

The focus of this paper is to make a case for GIs as strategic conduit through which agrifood local supply chain and rural development will be boosted. The main concern of this work, therefore, is to verify how the identification of these products and establishment of GI systems can propel sustainable development in local areas in Africa. Two assumptions are at the basis of our paper: viable GI systems can be established in Africa, and the establishment of a GI system can stimulate rural development. In order to clarify the process of setting up an efficient GI system, we will test GI virtuous circle and the Rural Web, with the purpose of exploring the multiple dimensions (endogenity, social capital, sustainability, novelty, institutional arrangements, governance of markets) that interact in the process at the agrifood supply chain level and in the context of rural level analysis. The analysis is applied to Shea butter production in Ghana and employed primary data. Questionnaires and interviews were administered in the study area (Yendi Municipality of Ghana) to gather both qualitative and quantitative data. Our analysis confirms the potentialities of Shea Butter as GI, and its underlying potency to serve as an engine for the development of local rural communities.

Sciforum-034388: Bawon: The Socio-Economic Security System of Rural Communities in Indonesia

Ali Yansyah Abdurrahim

[1] Research Center for Population, Indonesian Institute of Sciences (LIPI), Indonesia

[2] Rural Sociology Program Study, Bogor Agricultural University (IPB University), Indonesia

Various pressures, including an agricultural development policy called the green revolution, led to socio-economic and ecological changes in the countryside. Various scientific papers by scholars in the 1970s have mentioned that the green revolution that began in the late 1960s destroyed the bawon system which became the socio-economic guarantee system of Javanese rural communities. The mechanism of harvesting with the bawon system, which gives all rural households the opportunity to participate in harvesting rice in other people's fields and get a fair share of rice, is drastically replaced by a slash system that uses energy from outside the village. This causes polarization in terms of land tenure and income.

The loss of the bawon system shakes the sustainability of the village's social and ecological system which has structural implications and continues to paralyze the socio-economic security of rural communities. The bawon system which is an institutional form of original livelihood has a strategic position as the basis for rural livelihoods. The original institutional livelihoods that are manifested in associational ties are the most important part of the social-economic security net mechanism in rural areas. This mechanism has proven effective in being able to maintain and guarantee household socio-economic resilience, even in extreme situations, such as famine and economic crisis.

This paper wishes to present the results of an analysis of the latest development of the bawon system in rural Java and its influence on the sustainability and socio-economic sustainability of rural Javanese communities. The study was conducted in two villages in West Java (Indramayu Regency and Ciamis Regency) and two villages in Central Java (Klaten Regency and Banyumas Regency). In addition to using data (renewal) collected through interviews and discussions in 2020, the analysis also uses primary and secondary data that have been collected qualitatively and/or quantitatively in ICCTF research (2010-2011), PN9 LIPI (2010-2011), Featured LIPI (2011-2012), Thesis-Kemenristek (2014), and LIPI Social Laboratorium Program (2016-2017). The analysis was carried out using a sustainable livelihood approach which became one of the frameworks of the social-ecological system.

The analysis showed that the bawon system still survives in rice fields that have a limited irrigation network. The limitation of water as the most important natural capital for the cultivation of lowland rice becomes a binding block for the lowland rice farming community. Every household is required to be able to work together with other households in carrying out paddy farming activities as the main livelihood strategy in their village. The upper layer household of the paddy owner becomes very dependent on the lower layer household who does not have a paddy field to ensure the sustainability of their paddy field cultivation. Conversely, even lower-level households need access to rice fields as a source of food and a source of income.

This condition of interdependence and mutual need is what keeps the bawon system afloat. The bawon system is transformed into a strong social capital. Lower-level households that do not have rice fields can access, harvest, and get rice from the rice fields belonging to upper-level households with a predetermined distribution. Meanwhile, the upper layer households owning the rice land have the benefit of a guarantee of harvesting labor (human capital) that does not need to be paid in cash.

The reciprocity between them develops; not only limited when harvesting. Lower-level households involved in the bawon system are asked to work as farm laborers in a series of lowland rice cultivation activities. Beyond activities in the fields, the bonds of mutual assistance and mutual guarantee continue to grow. Upper-level households help lower-level households that need financial assistance, security, and various other needs, such as borrowing rice, money for school children and health, and vehicles (physical capital) for urgent needs. On the other hand, lower-level households help upper-level households when performing celebrations, thanksgiving, and other salvation events.

In some households, the financial access they obtain does not merely provide the ability to survive but develops into a consolidation strategy and an expansion strategy. In Indramayu, for example, money borrowed from upper-class households

to finance the training process and the departure of work to South Korea has succeeded in changing the social status of many lower-level households to upper-level households. After deducting to pay debts, the remaining income is used to rent, pawned, and buy paddy fields. Some use it to open new businesses, such as trade and transportation. Although there has been a shift in the status of the social strata, socio-economic ties between them continue, even some have increasingly developed into wider socio-economic networks.

Sciforum-031365: Geographical notes about post-productivist food in Spain. The reflections of producers, processors and marketers on food sustainability

Xosé A Armesto-López[1], M. Belén Gómez-Martín[1], Martí Cors-Iglesias[1], Emilio Martínez-Ibarra[2]

[1] Department of Geography, University of Barcelona

[2] Department of Regional Geographical Analysis and Physical Geography, University of Granada

The production and trade of post-productivist food in Spain, understanding these as those that are defined as organic, have a recognized geographical name or occur under the philosophy of the local, has become frequent in recent decades. The aim of this article is to show, on the one hand, the geographical extent have those products in a sample of representative businesses and, on the other hand, the perceptions that producers, processors and marketers of those products have regarding to sustainability through their work philosophies and their concrete actions. To do this, from a qualitative approach, we have made 20 semi-structured interviews to a sample of the agents mentioned above. We made the interviews in situ in their business in four Spanish regions differentiated from North, Central, South and East of the country. The type of food produced covers the main agricultural and livestock production of each proposed geographical area (meat, dairy products, cereals, fruits, vegetables, oils ...). Among the aspects that focused on these interviews were particularly revealing those who defined their business models and their relations with the regional environment both in the productive and / or economic as well as in the environmental, social and cultural aspects. The results of the study show, on the one hand, the different geographical ranges depending on the food and the post-productivist typology. On the other hand, stakeholders think there are palpable differences regarding the axes on which food should connect with sustainability. In both cases, the results depend on the productive context, the kind of product and the regional idiosyncrasy itself.

Sciforum-034296: Identifying Famine-Prone Countries

Mathis Wackernagel, Leo Wambersie, Alessandro Galli, David Lin

[1] Global Footprint Network

Over the past decades, food systems have become increasingly globalized and interconnected. Combined with rising agricultural yields, they have provided unprecedented food security to large parts of the world, despite the pressures of population growth. A more globalized food system can result in cheaper food prices and act as a buffer against local shocks to food production. But it also means that many more countries are able to exist on large foreign food dependence: they consume far more food than they can produce within their borders. These countries become more vulnerable to global shocks, of which the COVID-19 pandemic is an immediate example.

As the likelihood of destabilizing events increases due to climate change, economic frailty, or increasing demand, food risks increase, particularly for countries with both a high reliance on food imports, and incomes too low to effectively compete on the global market.

This research project aims to determine which countries are the most at risk of serious food insecurity, triggered by destabilizing events. We do so by determining the extent to which a country is dependent on foreign food, and if so, whether they have the necessary income to make up for the difference through purchasing food from abroad. The core assumption of our approach is that biocapacity deficits for food and low incomes compound risk far beyond what each variable may predict individually. For instance, high-income countries with high food deficits will be able outcompete others on the global marketplace for food. In contrast, low-income countries with a high domestic biocapacity will be able to satisfy demand internally, while countries that combine low incomes and high foreign food dependence can do neither. We used a number of different quantification methods to rank countries' risk exposure and identified the top 20 counties most at risk. All methods we applied generate nearly identical top-20 lists.

Sciforum-033896: Impact of Lockdown on vegetables supply chain and food security: Empirical evidence from Bangladesh

Dr G M Monirul Alam, Most Nilufa Khatun

[1] Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh

In Bangladesh, the COVID-19 pandemic is likely to have substantial effects on the livelihood of people, but smallholder vegetables growers will be even more affected because of the perishability nature of the product. The first case of COVID-19 was confirmed in Bangladesh on 8th March, 2020 and consequently the country went into lockdown on 26 March, 2020. The lockdown disrupted the food supply chain and increases the likelihood of food insecurity. This study has made a quick survey of vegetables growers (detailed survey was conducted on February, 2020) through a mobile phone to understand the impact of COVID-19 on vegetables supply chain, gross margin and the future production plan of the growers. Lockdown impede the farmers' access to market limiting their productive capacities and selling their produce. Due to COVID-19, the price of yield is found to drop more than double. The loss incurred by the farmers for producing Brinjal, Cucumber, Pointed gourd, Yardlong beans and Bottle gourd are Tk 4900, Tk 10900, Tk 57400, Tk 52500 and Tk 18500 per acre respectively as a result of COVID-19. The lower income from vegetables forced farmers to reduce the number of meals and food items per day and poses a huge challenge to continue produce.

Sciforum-031331: Impact of Oil Palm Development for Women: Double Role of Women and Livelihoods Alternative Sources in Rural Households

Dyah Ita Mardiyaningsih[1], Arya Hadi Dharmawan[2], Faris Rahmadian[1]

[1] Center for Agricultural and Rural Development Studies, Bogor Agricultural University

[2] Department of Communication and Community Development Sciences, Bogor Agricultural University

In rural households, the double role of women cannot be separated from domestic, productive and public activities. This is also the case with oil palm smallholder households in East Kalimantan Province, Indonesia, which are located around oil palm plantation companies. This research tries to see to what extent the development of oil palm plantations affects women's double role and provides new livelihood opportunities for rural households? Two villages in Kutai Kartanegara District were selected as case studies representing the categories of independent smallholder and independent plasma households. In the independent oil palm smallholder households, the role of women includes domestic activities (97%), productive activities in oil palm cultivation (21.9%), and public activities as laborers in oil palm plantations (45.7%). While in the independent plasma households that manage oil palm plantations carried out by cooperatives, the role of women in domestic activities (86%), productive activities in oil palm cultivation (0%), and public activities (17.6%). Based on data from the two research locations, the existence of oil palm companies provides a new alternative source of income for women in the public sector, especially as laborers to care for oil palm plants (fertilizing and clearing land from weeds) and falling palm oil fruit (*brondolan*) collection workers. Productive activities are also open to women from independent smallholder households so that the workload of women in these households is higher. The existence of oil palm plantations as a double-edged knife to women, on the one hand, is economically beneficial as an alternative source of livelihood for the rural households, on the other hand, is the cause of the burden of work for women to increase.

Sciforum-033399: International Trade and Sustainable Development: Special Focus on Food Security

Inmaculada Martinez-Zarzoso[1], Laura P. Barros[2]

[1] University of Goettingen; University Jaume I

[2] University of Goettingen

In this literature review, we present a systematic analysis of the academic published articles in economics that identify -with a sound statistical methodology- the impact of international trade and trade liberalization policies on socio-economic variables that are related to sustainable development. As a point of departure, we acknowledge the widely accepted finding that international trade is a key ingredient for economic growth in developing countries, as documented by Winters and Martuscelli (2014). Therefore, we do exclude the literature on the effect of trade openness on economic growth, which has been summarized elsewhere (Singh, 2010; Winters et al., 2004; Winters and Martuscelli, 2014), and focus exclusively on the more social-related and sustainable-related goals.

In order to profit from the benefits that could be derived from trade, such as reductions in poverty, higher wages and growing employment opportunities, socio-economic governmental policies are needed to mitigate the undesirable effects that structural change entails. For instance, growing income inequality, increasing levels of pollution or inadequate working conditions count as potential consequences of trade liberalization. Additionally, coherent and well-structured international trade rules and well-designed free trade agreements are an additional requirement for achieving sustainable and inclusive growth. This requires international cooperation between developed and developing countries, especially in the framework of the WTO.

We group the systematic survey of the empirical results around four themes. We start by examining how and to what extent trade effects are transmitted to the poor. Then, we turn to examine labour market effects and focus on how trade liberalization changes wages, employment and informality. The third theme refers to the environmental effects of trade reforms, focusing on the extent to which more openness is good or bad for the environment at the macro and micro level. Finally, we cover the effect of increasing trade flows on food security.

Sciforum-030449: Land use change, livelihoods and economic development policies: Implications for sustainable palm oil production in Honduras

Ingrid Fromm

[1] Bern University of Applied Sciences

The issues of land use change, livelihoods and economic development policies around palm oil production seem to be conflicting narratives. The implications of pushing economic and trade policies to help the sector grow usually come hand-in-hand with aspects of social and environmental impact. Palm oil production in Honduras illustrates this point, where land use change, livelihood and economic development policies have had unforeseen consequences. Honduras is currently positioned as one of the top palm oils producing and exporting countries in Latin America. According to figures from the Industrial Association of Oil Producers of Honduras (AIPAH), in 2018 the country exported 380 thousand tons of palm oil, which generated US$270 million in export revenues, placing palm oil as one of the country's main exports products. Palm oil is produced in over 120,000 hectares and over the last two decades, it has replaced another plantation crop-- banana. Although it's an industry dominated by only a few corporations, most of the production still takes place in small-scale farms. Since the early 2000s, the Honduran government promoted the palm oil sector by changing the regulatory framework in favor of corporate development through land expansion and increased production arguing the beneficial development of "green energy" and a green industry around it. The long-term consequences that have resulted have not been favorable from the environmental and social perspective. Recent price falls in the international market have resulted in a crisis which is mainly affecting small-scale producers. The results of the research give evidence of a sector which was highly promoted through targeted economic development policies and is indeed generating export revenues and economic growth, but at the same time faces challenges with the social and environmental impacts which threaten the livelihoods of small-scale producers.

Sciforum-031075: Mainstreaming sustainability in the palm oil sector in Cameroon

Fideline Mboringong[1], Ludovic Miaro[1], Durrel Halleson[1], Mesmin Tchindjang[2], Emmanuel Ngom[3]

[1] WWF, Yaounde, Cameroon

[2] University of Yaounde 1, Cameroon

[3] MINADER, YAOUNDE, Cameroon

Agriculture is one of the main factors of environmental degradation accounting for 24% of global greenhouse gas emissions (50% in Cameroon), thus contributing to climate change and deforestation/desertification. In addition, agricultural processes with intensive use of chemical inputs represent 37.8% of emissions. cocoa, rubber, sugar cane and oil palm are among the main commodities contributing to emission. Cameroon produced approximately 350 000 tons of palm oil in 2018 but the production is below the expected theoretical level of 500, 000 to 1, 000, 000t/Yr. The country resorted to importations to fill the gap. Cameroon's objective of increasing its palm oil production leads to the environment / oil palm cultivation dilemma from which a question emerges: how to reconcile oil palm production and the preservation of the environment? It is thus imperative to integrate sustainability in agricultural practices to reduce their negative environmental impacts while improving livelihoods for farmers and local communities. This contribution examines the conditions for the sustainability of palm oil production which provides 30,000 jobs in the formal sector in Cameroon.

The methodology is based on field observations and satellite images data. Botanical transects in the studied areas allowed the assessment of carbon stock. Also, questionnaire surveys were conducted with smallholders. Finally, ecosystem and landscape methods were used to assess the perception of populations on the dynamics of the landscapes affected by the development of oil palm cultivation.

The results show a clear decline in the forest areas (Sanaga Maritime and Ndian Basins) where the oil palm industry is dominated by small producers (61% farmers). The creation/extension of new oil palm plantations considerably shrunk, fragmented the forest and generated other negative externalities raising questions of pollution and waste management. This highlights the sustainability challenges in the oil palm sector in which suitable approaches require enhancement of positive impacts and reduction/elimination of negative effects.

Sciforum-031661: Motivations for sufficiency in individual dietary decisions – a typology

Moritz Lüchinger, Isabel Jaisli, Sonja Trachsel

[1] Zurich University of applied Sciences

The current food system is associated with enormous impact on the environment. A transformation of the whole system is therefore needed. However, technical and organisational improvements to increase efficiency of the food chain will not be sufficient to achieve a food system remaining within the planetary boundaries. Changes in dietary habits at the individual level are unavoidable, e.g. the reduction of meat consumption. Sufficiency is often been discussed in the context of different domains such as energy or housing, though little in the context of food consumption.

To gain insights on individual choices for a sufficiency diet (e.g. vegetarian), a qualitative study on individual motivations has been conducted. In a first step determinants were identified from literature which can be considered as a framework condition for a sufficiency diet. It was shown that five basic conditions are decisive for the individual choices: i) the personal values of a person, ii) his or her underlying goals, ii) influences such as social environment or family, iv) personal behaviour and v) the perceived effects of this dietary behaviour on the individual and the environment.

Using these defined conditions as framework, ten qualitative interviews were conducted with persons that self-declared to follow a sufficiency diet. Based on these results and the defined conditions, a typologisation has been developed, which resulted in four types of persons that follow a sufficiency diet: the Sustainable, the Healthy, the Athletic and the Conscious.

The results show that sustainability is only one of various motivations for sufficiency diets. The typologisations may help to adjust measures for promoting sufficiency diets in different target groups. Specifically, also people with little concerns for sustainability can be reached.

Sciforum-033816: Risk Perception by a Participatory Diagnostic Approach: a Case Study with Coffee Farmers at Chapada Diamantina, Brazil

Rodrigo Rudge Ramos Ribeiro[1], Samia Nascimento Sulaiman[2]

[1] Getulio Vargas Foundation

[2] Federal University of ABC

Rainfall conditions are an important factor to define coffee productivity and quality. The study area is the Chapada Diamantina mountains in the state of Bahia, northeastern Brazil, is a coffee producing area with extreme climatic variety, like the past drought events between 2012-2016. In addition to the natural hazard, there is a significant social vulnerability expressed in the production of small farmers. The objective was to assess the smallholder coffee farmers risk perception, using a participatory diagnostic approach. The methodology involved multimethod consisted of literature review, meteorological data analysis, semi-structured interviews, field work with technical visits to farms and World Cafe participatory workshop. Results shows that the drought was the main natural hazard identified by coffee farmers. They indicated the cultural, technical and economic obstacles to the adaptation strategies. A **conclusion** is an importance to collected qualitative data by participatory methodologies to access local knowledge and farmers' memory of climate on risk perception research.

Sciforum-033858: Rural-Urban Reciprocal Interactions and Challenges of Sustainable Food Security

Naser Shafieisabet[1], Neginsadat Mirvahedi[2]

[1] Assistant professor, Department of Human Geography, Earth Science Faculty, Shahid Beheshti University, Tehran, Iran.

[2] PhD Candidate of Geography and Rural Planning, Department of Human Geography, Earth Science Faculty, Shahid Beheshti University, Tehran, Iran.

In the 21st century, attention to sustainable food security is a fundamental factor in the self-reliance and independence of countries improving the dimensions of sustainable food security in many countries of the world is one of the major socioeconomic challenges of their policy and planning system. In recent decades, despite significant economic growth and improved human development in most countries, food insecurity and instability remain important. Therefore, in order to improve the dimensions of sustainable food security, most countries have paid special attention to the rural-urban reciprocal interaction approach in their planning and policy-making systems, such as: flow of products and increasing access to local consumers and sending to regional and international markets. On the urban side, the flow of goods, capital, information, etc. to rural settlements has been emphasized. The results of the present study, which was conducted in a library and documentary method, revealed that five main challenges in the field of sustainable food security are: lack of proper and productive education for farmers, low knowledge and skills of farmers in new production technologies, lack of adequate access to resources, Lack of participation for productive and non-productive investment, and improper marketing of products. In the interactive space between urban and rural areas, there are potentials for achieving food security and solving the challenges of empowering farmers, which in different countries, these capacities need to be identified and analyzed according to the structure and characteristics of each. Identifying the potential of rural-urban reciprocal interactions in different regions is essential to solve the challenges of food security and economic growth. The most important potentials of rural-urban reciprocal interactions are as fallowing: the flow of urban expert's labor to the village, purposeful institutionalization, providing agricultural services and production support, innovation in production and supply of products, branding and marketing, holding training workshops, production and service investment, establishment of organizations and enterprises and micro credit.

Sciforum-031332: Sustainability of independent oil palm farmers in multi-tier supply chain at Kutai Kartanegara district, East Kalimantan province

Fakhrizal Nashr[1, 2], Eka Intan Kumala Putri[3], Arya Hadi Dharmawan[4], Akhmad Fauzi[3]

[1] OPAL INDONESIA- Center for Agricultural and Rural Development Studies, IPB University

[2] Regional and Rural Development Planning Studies, Faculty of Economy and Management, IPB University

[3] Faculty of Economic and Management, IPB University

[4] Faculty of Human Ecology, IPB University

The global palm oil commodity supply trend has created a long, complex and fragmented multi-tier supply chains (MSC). The increased global demand and weak governance regulations of palm oil are among the drivers of expansion of oil palm plantations in Indonesia with 40% of the total production nationally were contributed from the smallholder oil palm plantations. The wicked problem of unsustainable oil palm sourcing, the expansion trend of oil palm cultivation, deforestation and biodiversity loss are often associated with the impact of the palm oil supply chain faced directly by Independent Smallholder Oil Palm Farmers (SHFs). Until now, research and precise data on the condition of SHFs have not been done much to get a better understanding of resource base views. The objective of this research is to analyze the sustainability status of the existing Multi-Tier Supply Chain Management and the application of Rapfish diagnosis with Multi-Dimensional Scaling (MDS) in the relation of oil palm mill, suppliers, and SHFs. The results showed the triadic typologies of MSC in Kutai Kartanegara District and the position of six dimensions of sustainability namely economic, social, ecology, politic, and institution as an input to improve the regional strategy for sustainable palm oil plantations in the East Kalimantan Province. The findings showed the Closed Triad Models in Gunung Sari and Pulau Pinang Villages have better performances on four sustainability dimensions as the oil palm mills were able to connect directly with SHFs and to reduce asymmetric information and rent seeking behaviour through corporate land ID system in environmental dimension.

Sciforum-030918: Tackling food sustainability through dietary change: a scenario analysis for Switzerland

Canxi Chen[1], Abhishek Chaudhary[2], Alexander Mathys[1]

[1] Laboratory of Sustainable Food Processing, Institute of Food, Nutrition and Health, ETH Zurich, Zurich, Switzerland

[2] Department of Civil Engineering, Indian Institute of Technology (IIT) Kanpur, Kanpur, India

Dietary change as a demand side intervention can greatly contribute towards the achievement of 2030 Sustainable Development Goals. Most previous studies analysing the consequences of dietary change focus on a single dimension of sustainability (e.g., environment) using a limited number of indicators and dietary scenarios. A multi-dimension evaluation with various quantitative indicators can assess the potential trade-offs and synergies for transition pathways.

We first designed nine alternative dietary scenarios (healthy Swiss diet, healthy global diet, vegetarian, vegan, pescatarian, flexitarian, protein- and meat-oriented diets, and a food greenhouse gas tax diet) based on current food consumption data. Next, we calculated five environmental (greenhouse gas emission, water, land, nitrogen and phosphorus use), three nutritional, one economic and one human health indicator for current and alternative scenarios.

Transition towards the healthy Swiss diet scenario is estimated to be the most sustainable option and is projected to result in 36% lesser environmental footprint, 33% lesser expenditure and 2.67% lower adverse health outcome (DALYs) compared with the current diet of Switzerland. Several dietary changes would bring food-related environmental footprints under planetary boundaries. In contrast, transition towards a meat or protein-oriented diet can lead to large increases in diet related adverse health outcomes, environmental footprint, daily food expenditure and reduced intakes of essential nutrients. Shifting to the vegetarian and vegan diet scenarios might lead to a reduction in intakes of micronutrients currently supplied primarily by animal-sourced foods. Our results show that achieving a sustainable diet would entail a high reduction in the intake of meat and vegetable oils and a moderate reduction in cereals, roots and fish products and increased intake of legumes, nuts, seeds, fruits and vegetables. Our analysis underscores the need for multiple indicators for dietary sustainability analysis and provides a template to conduct such studies in other countries and settings.

Sciforum-031390: Techno-economic feasibility of standard- and low-pressure drip irrigation systems for smallholder farmers

Julia Sokol, Georgia Van De Zande, Carolyn Sheline, Fiona Grant, Susan Amrose, Amos Winter

[1] Massachusetts Institute of Technology

The world is facing the challenge of reducing water use while increasing crop yields for growing populations, especially in Asia and Africa. Several countries in these regions have begun promoting drip irrigation as a way to modernize and increase crop production. However, adoption of drip irrigation is limited by several factors, including higher initial cost and energy use, compared to the more traditional but less water-efficient method of flood irrigation. Recently, researchers at MIT have begun reducing the cost and environmental impacts of drip systems by developing drip emitters with low operating pressure and creating a flexible system model for optimizing the design of solar-powered drip irrigation systems. Other non-profit and commercial efforts to make drip irrigation more accessible have included low-cost drip kits and solar pumps. However, there has not been a large-scale assessment of the techno-economic feasibility and environmental impacts of different drip irrigation systems in comparison to existing irrigation methods.

To address this gap, we use a flexible parametric system model to compare standard and low-pressure drip irrigation systems to flood irrigation systems, in on- and off-grid scenarios, in terms of water consumption, energy use, crop yields, and cost. We apply this model to multiple case studies representative of typical smallholder farms in the Middle East, North Africa, and Sub-Saharan Africa, to determine the major factors affecting the cost and benefits of drip systems in different environments, considering variations in weather, crops, and water sources. The results of this analysis can inform policymakers and NGOs in promoting appropriate irrigation technologies in different geographies and indicate directions for further research and development needed to increase the economic feasibility of drip irrigation. This work primarily addresses UN Sustainable Development Goals 1, 2, 6, 7, and 8.

Sciforum-031564: The economic potential of organic dairy products in the Albanian mountain areas and the impact of organic farming in the national food security issues. What challenges and prospects?

Florjan Bombaj

[1] Lecturer - Mediterranean University of Albania Associated Researcher - UMR Innovation, France

Albania is a small Balkan country in South-East Europe. Albania aims to joining the European Union (EU). The milk and meat value chains take an important place in the Albanian agrifood sector (MAFCP, 2018). The structuring of the national milk and meat value chains has affected the livestock production especially in the mountain's areas. The majority of farms remain small and fragmented. They are facing major constraints such as poor physical infrastructure, lack of state support and a non-competitive market situation.

Contrasting relief and typical Mediterranean pastures mainly explain the predominance of small ruminants in the mountainous area of Albania. As farms are quite small and mountain pastures are rich, the livestock is the key activity of the farming system and therefore, the main sources for the smallholders in the mountain areas. Animal products as a key resource for an endogenous local development (Bombaj, 2018).

According to the (Organic Data Network, 2018), around 45 producers are considered as organic in Albania and only 0.06% of all arable land is used for organic agriculture. Among the Balkan countries, with only 746.54 ha Albania is one of the countries with the smallest surface devoted to certified organic agriculture. The average size of Albanian farm is at 1.16 ha. Considering the small scale of Albanian farms during the conversion process of farmers in organic production, the organic agricultural area is still very small.

By using mixed approach, we have conducted more than 60 interviews in 8 villages of the municipality of Vithkuq. The results are also closely related to the new flagship project of the ETH Zurich World Food System Center « *Enhancing Resilience in Food Systems* » and can enrich this initiative by bringing field survey information's, evidences and facts from a disadvantaged mountain area in the Albanian rural development context. The results allow us to understand the current organic dynamics in the Albanian mountain areas and to identify the positive impacts of the organic farming on the national food security issues.

Sciforum-031182: The FAO programme on Globally Important Agricultural Heritage Systems and the opportunities for the sustainable development of rural areas

Antonio Santoro, Martina Venturi, Federica Corrieri, Francesco Piras, Mauro Agnoletti

[1] Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence

Rural areas all over the world have undergone significant changes in the last decades, mainly due to two opposite phenomena. Simplifying: on one side, the abandonment of marginal rural areas has led to the loss of agricultural areas and to huge migration trends towards the cities; on the other side, the agricultural practices intensification has caused the loss of a significant part of our agricultural heritage. Despite these changes, many rural areas still retain important traditional agricultural systems, that are receiving increasing attention at international level due to their multifunctional role.

In order to preserve and valorise these areas, the Food and Agriculture Organization (FAO) launched in 2002 the Globally Important Agricultural Heritage Systems (GIAHS) programme, with the aim of identifying agricultural heritage systems of global importance, preserving their landscape, agro-biodiversity, traditional knowledge and culture, applying principles of dynamic conservation in order to promote a sustainable development.

These areas can play a fundamental role for rural development and for reaching SDGs, since they represent examples of adaptation and resilience to climate change and socioeconomic transformations, as well as a crucial source of livelihood for the local communities and examples of high quality productive systems that can be replicated in other areas.

This presentation aims at introducing the concepts and opportunities related to the GIAHS programme and to the preservation of agricultural heritage systems, as well as the goals and results of an on-going research and training project carried out by the Department of Agriculture, Food, Environment and Forestry (DAGRI) of the University of Florence and funded by the Italian Agency for Development Cooperation (AICS).

Sciforum-034410: The Impact of Covid19 on Sustainable Development Goal2 in Ghana

Cynthia Akwei

[1] Liverpool John Moores University

This study examined the impact of COVID-19 on various components of the SDG 2: namely, ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture. The novel coronavirus disease (COVID-19) is spreading globally and has recorded 17.6million confirmed cases and 679,000 deaths within 213 countries and territories.[1] Many countries in sub-Saharan Africa (SSA) are reporting growing cases. Following the first confirmed case on March 12, 2020, Ghana has now recorded 35,501 confirmed COVID-19 cases with 32,096 recoveries and 182 deaths as of the 31 of July 2020. The nature of pandemic necessitated the imposition of a three-week lockdown of the three major metropolis (i.e. Accra, Kumasi and Tema) and a ban on social gatherings across the country. The key research question is how will the virus affect different aspects of the SDG2 in Ghana?

This study intends to contribute to a better understanding of the implications of the Covid19 on food security via reduced livelihood, food production, distribution or processing and can its impact on the achievement of the second Sustainable Development Goal (SDG) 2 of zero hunger. Data were obtained through semi-structured interviews, focus group discussions and secondary data from the public and key informants: farmers, supply chain operators and agricultural-related associations, institutions, and organisations.

The findings from the data highlight the fact that the Covid19 pandemic has impacted on all three areas of the SDG2 but are unevenly distributed and adversely affect the livelihoods and food security of individuals, households and communities with low income, unemployed and poor; hence, a negative effect on the SDG2 in reducing hunger and ensuring food security. The COVID-19 has increased food prices and created economic hardship, especially within urban and peri-urban areas of Ghana.

Sciforum-031301: The Problems of Acceptance of Indonesian Sustainable Palm Oil (ISPO) in International Market and its Complexity on the Ground

Rizka Amalia[1], Arya Hadi Dharmawan[1], Lilik Budi Prasetyo[1], Pablo Pacheco[2]

[1] IPB University

[2] World Wildlife Fund (WWF)

Oil palm plantations expansion is one way to realize economic development in Indonesia. The expansion always changes land cover from polyculture to monoculture. Therefore, the design of economic development through oil palm plantations expansion needs to be carefully. If the government is wrong in planning the economic development through oil palm plantations expansion then it is the same as planning the destruction of natural resources, environmental, economic and social. Indonesian Sustainable Palm Oil (ISPO) is governance that must be implemented to realize sustainable development. ISPO is called green habitus which can lead to socially and ecologically good living practices. However, ISPO implementation faces challenges at global, national and local levels such as recognition from global markets, lack of local and regional government capacity, and traceability of Fresh Fruit Bunches (FFB) from smallholders. This study aims to analyze the obstacles of ISPO implementation at the smallholders' level. This study uses a survey method to smalholders in two villages that are located in Kutai Kartanegara Regency, East Kalimantan, Indonesia and uses Companion Modeling (ComMod) at the village, regional and national levels. The results is ISPO as governance already has complete principles and criteria that covering legal, environmental, economic and social aspects. However, the implementation of ISPO becomes difficult, especially at the level of smallholders because (1) the lack of supporting systems from the government such as the absence of assistance from the government to smallholders; (2) the principles and criteria are too heavy for smallholders to fulfill, especially related to Good Agricultural Practices (GAP), land legality, environment legality and business legality; (3) the cost is relatively expensive for smallholder; (4) the lack of incentives; and (5) weak of law enforcement. Therefore, the problem of traceability FFB's smallholders have remained then makes the global market distrust to oil palm in Indonesia.

Sciforum-030325: Towards a post-lethal agricultural system

Stefan Mann

[1] Agroscope

Could we stop killing? – visions of a post-lethal vegan or vegetarian agriculture

1. Introduction

Even before agriculture emerged 10 000 years ago, the combination of harvesting crops and killing animals have been the two constituting bricks of organizing the nutrition of mankind. However, a lot has happened since then. One more or less recent development in human evolution is a decreasing tolerance against violence, and an increasing number of campaigns quantifies this on a zero level (Hall et al., 2011; Pavlova and Petrova-Geretto, 2018), while scholars with a macro perspective describe a more and more peaceful world (McNally, 2012; Petterson et al., 2019). However, could it happen that this tendency to avoid lethal actions extended to agriculture? That we as a society could not tolerate the regular killing of animals for food purposes anymore so that we would enter a post-lethal phase of farming? While this may sound like an unconventional proposition, it is the first objective of this paper to make the vision of such an agricultural system plausible. This will be attempted in Section 2.

Our knowledge about the global impact of livestock has become considerable. We know that 70 per cent of agricultural land is used to feed livestock (van Zanten et al., 2016) and that husbandry causes around 18 per cent of global greenhouse emissions (Herrero et al., 2011). Estimates of the land per person needed for a vegan diet range from 700 square metres (Visak, 2007) to 1400 square metres (Zanten et al., 2016), so that it is less questionable how a vegan planet could feed a world population of ten billion than it is under the status quo. Springman et al. (2016) have emphasized the health advantages (in addition to environmental advantages) of a vegan planet. However, how such a vegan planet would look like, how production would be organized, is a surprisingly unanswered question. The fact that vegan consumption has been elaborated to a much greater detail (Glick-Bauer and Yeh, 2014; Kristensen et al., 2015; Clarys et al., 2017) than vegan production, can be attributed to the fact that the vegan movement has its center in cities, not in the countryside (Twine, 2017). Therefore, the second and main objective of this paper is the collection of available knowledge about the main challenges and possible solutions for a post-lethal agricultural system, focusing on the substitution of animal-based manure and on the use of grassland.

2. Driving factors

2.1 Demand side

When Singer (1975; xi) introduced the concept of animal liberation, he conceded at the time that it sounded “more like a parody of liberation movements than a serious objective”. However, instead of being bluntly rejected, Singer’s position instead became increasingly socially acceptable over the decades since. While Singer followed a utilitarian way of argument, Regan (1983) soon made clear that a deontological position would lead to even more radical positions: it would not only be unethical to kill animals, animals would, as humans, have the right to live.

Since that time, the overwhelming majority of philosophers have leaned towards similar results as Peter Singer and Tom Regan. As soon as one rationally analyses our agricultural practice of husbandry, it was likely that scholars came to the conclusion that these practices were fundamentally unethical. If moderate philosophers did not go so far to demand veganism but rather demanded more animal welfare (such as Kiley-Worthington, 1989, and Tester, 1991), it usually was not so much because they were able or willing to defend killing animals, but mostly for strategical and pragmatic reasons. However, the voices that demand that legal personhood should be given to animals so that they are protected from being killed (Donaldson and Kymlicka, 2011; Kotzmann and Pendergrast, 2019) and that emphasize how unlikely it is that the killing of animals for meat consumption can be defended on ethical grounds (Visak, 2013; Fisher, 2019) have clearly become the dominant voices in the debate.

Swabe et al. (2005) in the Netherlands were among the first to ask a representative sample of the population about the legitimacy of killing animals for food purposes, getting 6.4 % No answers and 14.1 % being undecided. For this question, however, the dynamics works in a clear direction. A German survey in 2015 (TNS Emnid, 2015) indicated that only 72 per cent of respondent supported the legitimacy of killing pigs. And Riffkin (2015) reports that the share of US residents who believe that animals should have the same rights as humans rose from 25 per cent in 2008 to 32 per cent in 2015. Very roughly, it seems that one quarter or third of the Western population objects the killing of animals for food purposes.

Other surveys as displayed by Wikipedia (2020) indicate that around 10 per cent of the population in Western countries follows a vegetarian diet, and much less, perhaps two or three per cent, a vegan diet. The expert opinion does not fully translate to the popular opinion, but the development on the expert side leave their traces in the general discourse. Likewise, the growing opposition against killing farm animals slowly and partially translates into the personal consequence of skipping meat consumption. And it is only a tiny minority, yet which takes the last step of forgoing the consumption of eggs and milk which today is still necessarily connected to killing animals as well.

The factor that plays into the hands of post-lethal agriculture is that irrationality presumably plays a large role in the delays between the developments. It is unlikely that the three quarters of Germans in favour of killing pigs have better arguments than the majority of animal ethicists being against it. While the majority of the 28 per cent being opposed to kill pigs still eat meat, it will be difficult for them to defend this practice. As for vegetarians who eat eggs for which millions of male chicklets and female chickens are killed (Mann and Visak, 2019), it will be impossible to bring this into accordance with their personal convictions. As Örnebring (2007) remarks that the rational-critical debate needs time to gestate, it is likely that these contradictions at least lead into the direction of post-lethal agriculture.

2.2 Supply side

The market for meat substitutes currently is among the, if not the most dynamic segment of the food market. Both start-ups (Lacourrége, 2020) and large companies like Nestle (Jiang, 2019) are heavily investing in the development of products which are fully crop-based but taste similar to meat. Similarly, egg substitution products have entered retailing in 2018 (Semuels, 2020). While the high-price segment of this market often uses insects as ingredients, which show a good environmental balance (Smetana et al., 2016), the bulk of the market for meat and egg substitutes is made of protein crops such as beans and peas. Other companies use algae to compose fish substitutes (Wells et al., 2017).

Yet, meat substitution products still suffer from the fact that neither the taste (Elzerman et al., 2013) nor the appearance (Elzerman et al., 2011) reach the qualities of meat. However, it is likely that it is a question of time that this problem can be solved. Not only do companies invest major amounts of money into the development of these products, but also research pushing lab-grown meat that exactly has the quality of animal muscles is on the forefront (Galusky, 2014; Berkovici, 2017). While the price of these products is still prohibitively high, it is likely that technological progress is bringing production costs down.

The demand for meat substitutes is still limited to minor consumer segments (Vanhonacker et al., 2013; Apostolidis and McLeay, 2016). It is easy to see, however, that this is likely to change. Imagine that neither qualities nor costs of meat substitution products would differ from those of meat products. Only sadists could, under these conditions, condone the suffering of animals being slaughtered and stick to conventional meat consumption.

It is therefore plausible to ask at which stage of the development of meat substitutes it would be time to enter vegan agriculture for society as a whole. How tasty to products made out of yellow peas have to become, how low-priced does lab-grown meat have to be, in order to make a national or even international decision that killing animals for food purposes is a habit of the past?

If not this very question is misled already, it is definitely worthwhile to explore how agricultural systems without the killing of animals could look like, a question to be approached subsequently.

3. Substituting animal-based nutrients for crops

In a vegan farming system, it is likely that the land covered by maize and barley would shrink, as these crops are mainly used for feed purposes, whereas the area for vegetables and protein crops such as peas and beans would probably be expanded. These shifts, however, would not question the production system of arable crops as such. The main challenge of vegan agriculture comes from the supply of organic matter to arable soils, which would not come from farm animals in a vegan system. Instead, there are real and potential alternatives to be briefly sketched in the following paragraphs.

3.1 The biocyclic-vegan standard

In 2017, the Biocyclic Network Services issued the first standard for a vegan production system which they termed "biocyclic-vegan standard". This standard has since been acknowledged as one of three global organic standards by the International Federation of Organic Agriculture (IFOAM), in addition to the IFOAM standard and the International Standard for Forest Garden Products.

The standard refers back to the work by Rusch (1955; 1968) and his followers about "circles of the living substance" and has the ambition "to offer the crops growth conditions that are as natural as possible" (p.6). Biocyclic-vegan agriculture builds on all requirements of organic agriculture but sets two additional conditions. The first concerns the centrepiece of biocyclic-vegan agriculture, which is mature plant-based compost, which delivers humus to the soil. The application of such compost is key to the system. In addition, on-farm biodiversity is rated with the so-called Biocyclic Operation Index and has to reach a level of six out of ten points.

Eisenbach (2019) has run first field experiments with sweet potatoes and tomatoes comparing biocyclic-vegan and organic agriculture. She reports considerable additional yields if compost is applied to the crops.

3.2 Conventional vegan nutrient management

It is probably unwise to rely fully on an extension of organic farming when considering the option of a (regional or national) full conversion to a post-lethal system. A meta study by de Ponti et al. (2007) has shown that organic crops yield, on average, 20 per cent less than conventional ones, and that the gap is rather increasing over time. At the same time, organic production costs are usually higher than for conventional crop production (Brumfield et al., 2000). If the vast majority of farmers in Western countries relies on mineral fertilizers and synthetic pesticides, it is crucial to define a post-lethal agrarian system in which these materials are still accessible.

If animals are not part of the farming system anymore and manure is, accordingly, not available, there are basically three different ways to cope with that:

- Working with mineral fertilizer only may be a viable way. This does not necessarily mean that more mineral fertilizer would be applied. To the contrary, field experiments by Görlitz and Asmus (1978) show that the yield-maximizing mineral fertilizer application is higher if 50 kg/ha organic fertilizer are also added. However, it can be expected that yields without organic fertilizer would decline by around ten per cents. The effect of skipping organic fertilization on soil composition would be more significant. C/N ratios in soils without orqanic fertilizer are low (Marschner et al., 2003), NH_3-N is low (Xu et al., 2003) and bacteria concentration rather high (Li et al., 2016), while microbial biomass is low (Birk et al., 2009). Long-term experiments of using mineral fertilizer only show that the productive capacity of soils remains more or less intact, even if the organic content declines (Berecz et al., 2005; Singh Sekon et al., 2011).

- It is certainly advantageous, both in terms of yield and organic substance in the soil, if the manure of animal origin can be substituted through vegetal matter. The biocyclic-vegan standard is just a case in point in this practice, but vegetal fertilizer can be combined with mineral substance, and it also can be used in different stages. In a paper on vegan greenhouse production, for example, Schmutz and Foresi (2017; 481) mention "plant-based composts, mulches and other biomass." Wastewater from the processing of crops, such as cassava wastewater (Ferreira Ribas et al., 2010), would also fall into this category. While a lot of positive experiences with a broad variety of vegetal fertilizers is available (eg. Pellejero et al., 2017; Bonfim-Silva et al., 2018, Xu et al., 2018), a vegan system on a broader scale would face the challenge of organizing sufficient amounts of vegetal substance for organic fertilization. It is yet unclear, for example, whether more investment in catch crops would be necessary compared to today's situation to maintain soil fertility.

- Petterson and Wikström (2016) report from a trial that one person produces fertilizers amounting to a value of 50 Euros per year. In an agricultural system in which animal manure becomes unavailable, it is likely that this value rather rises than falls. Under current sewage systems, however, the use of human fertilizer poses serious issues of hygiene and toxicity (Buchauer, 2007). Mahon et al. (2017) and Li et al. (2018) recently reported problems of microplastics in sewage sludge, whereas problems of toxic metal residues (McBride, 2003) or phenolic compounds (Lee and Peart, 2002) have been known for a longer time. Several countries reacted to these and similar problems by banning the use of sewage sludge in agriculture, others imposed severe restrictions. The incentive to invest in more sustainable systems of utilizing sewage sludge may become a worthwhile issue in a vegan society.

4. The fate of grassland

Animals do not only produce manure, a part of them currently also provides the most economic way of utilizing grassland. Cattle, sheep and goats are the most important species which either graze on pastures or are fed with grass harvested by machines. This leads to the question what would happen to the grassland in a post-lethal agricultural system. The use of the land could certainly be transformed, whereas in other cases animals might still play a role.

- Substitution

The Umweltbundesamt (2019) reports a significant reduction of grassland in Germany between 1991 and 2003, which was caused by economic forces and only halted by a change in the Common Agricultural Policy that, due to the negative environmental impact of grassland ploughing (Vellinga et al., 2004) provided incentives to keep the grassland. It is difficult to obtain numbers which share of today's grassland is potentially arable and this number differs strongly between regions; but it is likely to assume that in productive regions, the conversion to arable land is the most likely destiny of grassland not used for grass production any more.

In remote and less fertile areas, it is much more likely that shrubland and eventually forests replace unused grassland. Such transitions are well known, albeit without any reference to veganism. The normative connotation of such developments varies strongly in dependence of socioeconomic conditions. The afforestation of grassland in Ecuador has been described as a means of economic development (Farley, 2007), whereas the same process in the Austrian Alps has been described as landscape degradation (Borsdorf and Bender, 2007). In any case, forest-grassland transects are rich in biodiversity (Magura et al., 2001, Yu et al., 2007) so that abandoning grassland will have detrimental effects on species richness.

- Post-lethal grassland management

Grassland, at least in some locations, provides positive externalities. This is true because of its effect on biodiversity, but also as part of an attractive landscape (Krumalova, 2002; Marangon and Visintin, 2007; Thenail et al., 2009). It is therefore worthwhile to consider how the killing of animals and the management of grassland can be decoupled.

The simplest option in this case is certainly the mechanical preservation of grassland. The Bayerische Landesamt für Umwelt (2011) has collected calculations of average costs for preserving grassland without animals. If the cut grass is left on the plot, costs vary (dependent on natural conditions) between 30 and 150 Euros per hectare, whereas costs for mowing and removing the grass average 180 Euros per hectare. The demand for compost (see Section 3) will often justify the cut and removal of the grass. However, society's willingness to pay has not to be excessively high to justify mechanical grassland management.

The Bayerische Landesamt für Umwelt (2011), however, also calculates costs of grassland preservation through animals. Again, the cost level is strongly dependent on the natural conditions. If animals can survive the winter on the land, however, the resulting costs per hectare are rather lower than the costs for mechanical grassland management.

This observation opens an important issue: vegan agriculture is not necessarily agriculture without animals. Meyer-Glitza (2010; 2015) has focused on systems that keep, but do not kill animals. Today, the vast majority of the few existing cases are benevolent non-profit farms, which keep animals not needed on productive farms any more in order to preserve them from being slaughtered. In a major vegan system, it should not be excluded that ruminants are kept as a low-priced means for preserving grassland.

On a few of the farms analyzed by Meyer-Glitza (2015), cows are milked, even though they are not killed after their productive period. This indicates that a post lethal agricultural system is not necessarily a vegan system but could be entirely vegetarian. While the ethics of milking is a controversial issue (Stuart et al., 2013; Driessen and Heutinck, 2015; Milburn, 2018), it is important to note that today's link between milk and egg production and killing animals is not a necessary link. In a system in which both male and female animals could live to their natural death or where (in the case of cows) sexed sperm is used to avoid the birth of male animals (Seidel, 2007), would radically change husbandry. Due to the decrease in fertility over an animal's life course and the "unproductive" life animals, it is plausible to assume that the price of milk and eggs would rise by a major factor.

5. Beekeeping

Bees are not slaughtered in conventional agriculture, so that there is disagreement if honey can be part of a vegan diet (Lamey, 2008). Morris (2018) summarizes both utilitarian and deontological arguments against taking honey from bees. Should a society submit to his arguments, could many fields not be pollinated anymore because most bees rely on humans support in surviving winter periods?

Not many vegans argue against the use of bees in pollination. Even today, increasingly many bee hives are kept for just this service, honey becoming a secondary outcome of their activities. Sumner and Boriss (2006), Desjardins and De Oliveira

(2006) and many other economists like to describe this emergence of a new market due to shifting scarcities. As farmers, particularly in the fruit sector, have a willingness to pay for a pollination of their crops, there is no reason to assume that this service would vanish in a post-lethal system.

6. Discussion: emerging post-lethal systems

The good news: should geographical entities decide to switch to post-lethal agricultural systems, it is an entirely possible option. This might be eco-villages (Barton and Kleiner, 2013) or Biosphere Reserves (Reed and Price, 2019), before entire nations may decide to follow this pathway.

In fact: as any farmer today can and has to choose between different production systems she may enter, there are also several different post-lethal systems. And while it could be shown by many rural sociologists (Mann and Gairing, 2012; Sahm et al., 2013) how both external socioeconomic and internal, motivational factors drive this choice, this would certainly be the case for such choices in post-lethal agriculture. The following broad types of systems can be distinguished.

- Vegan-organic agriculture will be able to overcome the challenge of substituting organic manure. The proponents of biocyclic vegan agriculture have shown compost as an option. Other options involve less composted vegetal materials like leafs or straw, but possibly also sewage sludge.
- Vegan-conventional agriculture would continue to cover the major part of nutrient losses from harvests through mineral fertilizer. To keep the organic content up in arable soils, however, the same substitutes would be applied.
- Post-lethal vegetarian agriculture, being organic or not, would continue to use animals, in particular for grassland management, but would not kill them. Even chicken and bees might be part of such a system to secure the future supply of eggs and honey to the table, even though production costs would exceed today's costs by several factors.

7. Open questions

Often, academic papers conclude with a reference to one or two open questions that still need research. In the case of post-lethal agricultural systems, the number of open, unresolved questions is much larger than that.

While many systems can be described as technically possible, their physical productivity is largely unknown. The first few field trials of biocyclic-vegan farming may have brought optimistic results. However, this only underlines the necessity of experimenting with many different varieties of arable systems without animal manure. This includes long-term trials with an emphasis on organic content in arable soils.

It is likely that the importance of organic substances from human waste systems would gain importance in post-lethal agriculture. It may therefore be worthwhile to invest in hygienic standards, substantially reducing the influx of toxic substances, which would deteriorate arable production. Thus, post-lethal agriculture may induce innovation in waste management.

Post-lethal vegetarian agriculture introduces a long list of new challenges in animal management. How could long-time fertility of chicken or cows be preserved? What are the dynamics of chicken groups with an equal balance of male and female animals? And which production costs result from systems in which all animals are fed, while only a part is productive?

This last question leads to the entire issue of agricultural economics. Swiss farmers, for example, today earn more than three times as much from selling animal products than from selling vegetal products. The structural change that post-lethal agriculture would induce has both to be understood and to be wisely managed.

As it is likely that parts of our global society is going to demand post-lethal agricultural production rather sooner than later, it would be wise to now enter the research agenda connected with such a switch.

References

Apostolidis, C., F. McLeay (2016): Should we stop meating like this? Reducing meat consumption through substitution. Food Policy 65 (1) 74-89

Barton, H., D. Kleiner (2013): Innovative Eco-Neighbourhood Projects. In H. Barton: Sustainable Communities. London: Routledge

Bayerische Landesamt für Umwelt (2011): Kostendatei für Maßnahmen des Naturschutzes und der Landschaftspflege. Augsburg: BLU

Berecz, K., Z. Kismanyioky, K. Debreczeni (2005): Effect of Organic Matter Recycling in Long-Term Fertilization Trials and Model Pot Experiments. Communications in Soil Science and Plant Analysis 36 (1-3) 191-202

Berkovici, J. (2017): Why This Cardiologist Is Betting That His Lab-Grown Meat Startup Can Solve the Global Food Crisis. Inc November 2017

Birk, J.J., Steiner, C., Teixiera, W.C., Zech, W. & Glaser, B. (2009). Microbial response to charcoal amendments and fertilization of a highly weathered tropical soil. In: Amazonian Dark Earths: Wim Sombroek's Vision (eds W.I. Woods, W.G. Teixeira, J. Lehmann, C. Steiner, A. WinklerPrins & L. Rebellato), pp. 309– 324. Springer, Dordrecht

Bonfim-Silva, E.M., H.A. Weimar Castro, P.F. de Rezende, H. Giumaraez Favare, L.G. Araujo Dorado (2018): Wood Ash as a Corrective and Fertilizer in the Cultivation of Mombaça and Massai Grass in Oxisol. Journal of Experimental Agriculture 21 (5) 1-10

Borsdorf, A., O. Bender (2007): Kulturlandschaftsverlust durch Verbuschung und Verwaldung im subalpinen und hochmontanen Höhenstockwerk: Die Folgen des klimatischen und sozioökonomischen Wandels. Innsbrucker Geographische Gesellschaft, Alpine Kulturlandschaft im Wandel: Hugo Penz zum, Vol. 65, Geburtstag. Geographie Innsbruck, Innsbruck, pp. 29-50

Brumfield, R.G., A. Rimal, S. Reiners (2000): Comparative Cost Analyses of Conventional, Integrated Crop Management, and Organic Methods. HortTechnology 10 (4) 785-793

Buchauer, K. (2007): Hygienische Standards für die Verwertung von Klärschlamm in der Landwirtschaft – ein internationaler Vergleich. Innsbruck: ARA Consult

Clarys, P., T. Deliens, I. Huybrechts, P. Deriemaeker, B. Vanaelst, W. de Keyzer, M. Hebbelinck, P. Mullie (2017): Comparison of Nutritional Quality of the Vegan, Vegetarian, Semi-Vegetarian, Pesco-Vegetarian and Omnivorous Diet. Nutrients 6 (3) 1318-1332

Desjardins, E.-C., D. de Olveira (2006) : Commercial Bumble Bee *Bombus impatiens* (Hymenoptera: Apidae) as a Pollinator in Lowbush Blueberry (Ericale: Ericaceae) Fields. Journal of Economic Entomology 99 (2) 443-449

Donaldson, S., W. Kymlicka (2011): Zoopolis: A Political Theory of Animal Rights. Oxford: Oxford University Press

Driessen, C., L.F.M. Heutinck (2015): Cows desiring to be milked? Milking robots and the co-evolution of ethics and technology on Dutch dairy farms. Agriculture and Human Values 32 (1) 3-20

Eisenbach, L. (2019): First field experiments using biocyclic humus soil for processing tomato and sweet potato. http://www.biocyclic-vegan.org/wp-content/uploads/2019/01/biocyclic-lydiaGGI40.pdf (Feb 17, 2020)

Elzerman, J.E., A.C. Hoek, M.A.J.S. van Boekel, P.A. Luning (2011): Consumer acceptance and appropriateness of meat substitutes in a meal context. Food Quality and Preference 22 (3) 233-240

Elzerman, J.E., M.A.J.S. van Boekel, P.A. Luning (2013): Exploring meat substitutes: consumer experiences and contextual factors. British Food Journal 115 (5) 700-711

Farley, K.A., (2007): Grasslands to Tree Plantations: Forest Transition in the Andes of Ecuador. Annals of the Association of American Geographers 97 (4) 755-771

Ferreira-Ribas, M.M., M. Pascoli Cereda, R.L. Villas Boas (2010): Use of cassava wastewater treated anaerobically with alkaline agents as fertilizer for maize (Zea mays L.). Brazilian Archives of Biology and Technology .53 (1) 55-62

Fisher, A. (2019): Against killing 'happy' animals. In A. and C. Linzey: Ethical Vegetarianism and Veganism. New York: Routledge

Galusky, W. (2014): Technology as Responsibility: Failure, Food Animals, and Lab-grown Meat. Journal of Agricultural and Environmental Ethics 27 (6) 931-948

Glick-Bauer, M., M.-C. Yeh (2014): The Health Advantage of a Vegan Diet: Exploring the Gut Microbiota Connection. Nutrients 6 (11) 4822-4838

Görlitz, H., E. Asmus (1978): Einfluss organischer und mineralischer Düngung auf Pflanzenertrag und Stickstoffnutzung auf einer Tieflehm-Felderde. Archiv Acker- und Pflanzenbau und Bodenkunde 22, 109-122

Hall, B., J. Kulig, R. Grant-Kalischuk (2011): Rural Youth and Violence: A Gender Perspective. Rural and Remote Health 11 (online): 1716

Herrero, M., P. Gerber, T. Vellinga (2011): Livestock and greenhouse gas emissions: The importance of getting the numbers right. Animal Feed Science and Technology 166, 779-782

Jiang, H. (2019): I tried the plant-based burger Nestlé is launching to compete with Beyond Meat and Impossible Foods. Here's what it tastes like. https://www.businessinsider.com/nestle-competes-beyond-meat-impossible-foods-plant-based-meat-2019-8?r=US&IR=T (Feb 11, 2020)

Kiley-Worthington, M. (1989): Ecological, ethological, and ethically sound environments for animals: Toward symbiosis. Journal of Agricultural Ethics 2 (4) 323-347

Kotzmann, J., N. Pendergrast (2019). Animal Rights: Time to Start Unpacking What Rights and for Whom," Mitchell Hamile Law Review 6 (1) 158-199

Krumalova, V. (2002): Evaluation of chosen benefits on environment and landscape coming from Czech agriculture. Agricultural Economics 48 (1) 13-17

Lacourrége, D. (2020): Huhn, gepflanzt. Coop Zeitung, 4/20, 32-35

Lamey, A (2008): Food Fight! Davis versus Regan on the Ethics of Eating Beef. Journal of Social Philosophy 38 (2) 331-348

Lee, H.-B., T.E. Peart (2002): Organic Contaminants in Canadian Municipal Sewage Sludge. Part I. Toxic or Endocrine-Disrupting Phenolic Compounds. Water Quality Research Journal 37 (4) 681-696

Li, S. S. Zhang, Y. Pu, T. Li, X. Xu, Y. Jia, Q. Deng, G. Gong (2016): Dynamics of soil labile organic carbon fractions and C-cycle enzyme activities under straw mulch in Chengdu Plain. Soil and Tillage Research 155 (1) 289-297

Li, X., L. Chen, Q. Mei, B. Dong, X. Dai, G. Ding, E.Y. Zeng (2018): Microplastics in sewage sludge from the wastewater treatment plants in China. Water Research 142, 75-85

Mahon, A.M., B. O'Connell, M.G. Healy, I. O'Connor, R. Officer, R. Nash, L. Morrison (2017): Microplastics in Sewage Sludge: Effects of Treatment. Environmental Science & Technology 51 (2) 810-818

Magura, T., B. Tothmeresz, T. Molnar (2001): Forest edge and diversity: carabids along forest-grassland transects. Biodiversity & Conservation 10, 287-300

Mann, S., M. Gairing (2012): 'Loyals' and 'Optimizers' – shedding light on the decision for or against organic agriculture among Swiss farmers. Journal of Agricultural and Environmental Ethics 25 (3) 365-376

Mann, S., T. Visak (2019): Biogas or salami? An ethical analysis of two chains for end-of-lay hens. International Journal of Social Economics 46 (6) 838-848

Marangon, F, F. Visintin. (2007): Rural landscape valuation in a cross-border region. Cahiers d'Economie et de Sociologie Rurales, INRA Editions, 2007, 84-85, pp.113-132

Marschner, P., E. Kandeler, B. Marschner (2003): Structure and function of the soil microbial community in a long-term fertilizer experiment. Soil Biology and Biochemistry 35 (3) 453-461

McBride, M.B. (2003): Toxic metals in sewage sludge-amended soils: has promotion of beneficial use discounted the risks? Advances in Environmental Research 8 (1) 5-19

McNally, R.J. (2012): The Ontology of Posttraumatic Stress Disorder: Natural Kind, Social Construction, or Causal System? Clinical Psychology 19 (3) 220-228

Meyer-Glitza (2010): Nicht-tötende Rinderhaltung als neue Herausforderung für den Ökologischen Landbau – eine Fallstudie. In A. Pilch-Otega, A. Felbinger, R. Mikula, R. Egger: Macht – eigensinn – Engagement. Heidelberg: Springer

Meyer-Glitza, P. (2015): Cattle husbandry without slaughtering: case studies from Europe and India. In D.E. Dumitras, I.M. Juitea, S. Aerts: Know your food. Wageningen: Wageningen Academic Publishers

Milburn, J. (2018): Death-Free Dairy? The Ethics of Clean Milk. Journal of Agricultural and Environmental Ethics 31 (3) 261-279

Morris, J. (2018): The philosophy of animal activism. Utrecht: University of Utrecht

Örnebring, H. (2007): A Necessary Profession for the Modern Age?: Nineteenth Century News, Journalism and the Public Sphere. In R. Butsch: Media and Public Spheres. New York: palgrave

Pavlova, G., E. Petrova-Geretto (2018): Agression against medical doctors – genesis and management approaches. Trakia Journal of Sciences 16 (1) 46-51

Pellejero, G., A. Miglierina, G. Aschkar, M. Turcato, R. Jimenez-Ballesta (2017): Effects of the onion residue compost as an organic fertilizer in a vegetable culture in the Lower Valley of the Rio Negro. International Journal of Recycling of Organic Waste in Agriculture 6, 159-166

Petterson, J., J. Wikström (2016): Human fertilizer and the productivity of farming households. Agroecology and Sustainable Food Systems 40 (1) 48-68

Petterson, T., S. Högbladh. M. Ölberg (2019): Organized violence, 1989–2018 and peace agreements. Journal of Peace Research 56 (4) 589-604

Reed, M.G., M.F. Price (2019): Introducing UNESCO Biosphere Reserves. In M.G. Reed, M.F. Price: UNESCO Biosphere Reserves: Supporting Biocultural Diversity, Sustainability and Society. London: Routledge

Regan, T. (1983): The case of animal rights. Berkeley: University of California Press

Riffikin, R. (2015): In U.S., More Say Animals Should Have Same Rights as People. https://news.gallup.com/poll/183275/say-animals-rights-people.aspx (Feb 10, 2020)

Rusch, H.P. (1955): Die Naturwissenschaft von morgen. Krailing: Hans-Georg Müller

Rusch, H.P. (1968): Bodenfruchtbarkeit – eine Studie biologischen Denkens. Heidelberg: H.G. Haug

Sahm, H., J. Sanders, H. Nieberg, G. Behrens (2013): Reversion from organic to conventional agriculture: A review. Renewable Agriculture and Food Systems 28 (3) 263-275

Schmutz, U., L. Foresi (2017): Vegan organic horticulture – standards, challenges, socio-economics and impact on global food security. Acta Horticulturae, 475-484

Seidel, G.E. (2007): Overview of sexing sperm. Theriogenology 68 (3) 443-446

Semuels, A. (2020): Feeding a changing world. TIME Magazine, 3.2.20, 62-67

Sing Sekhon, K., J.P. Singh, D. Singh Mela (2011): Long-term effect of manure and mineral fertilizer application on the distribution of organic nitrogen fractions in soil under a rice–wheat cropping system. Archives of Agronomy and Soil Science 57 (7) 705-714

Singer, P. (1975): Animal liberation: A new ethics for our treatment of animals. New York: Avon Books

Smetana, S., M. Palanisamy, A. Mathys, V. Heinz (2016): Sustainability of insect use for feed and food: Life Cycle Assessment perspective. Journal of Cleaner Production 137, 741-751

Springman, M. H.G.J. Godfray, M. Rayner, P. Scarborough (2016): Analysis and valuation of the health and climate change cobenefits of dietary change. PNAS https://doi.org/10.1073/pnas.1523119113

Stuart, D., R.L. Schewe, R. Gunderson (2013): Extending Social Theory to Farm Animals: Addressing Alienation in the Dairy Sector. Sociologia Ruralis 53 (2) 201-222

Sumner, D.A., H. Boriss (2006): Bee-conomics and the leap in pollination fees. Agricultural Research Economic Update, 9

Swabe, J.M., B.L. Rutgers, E.N. Noordhuizen-Stassen (2005): Cultural attitudes towards killing animals. In F.H. de Jonge, R. van den Boos: The Human-Animal Relationship. Amsterdam: Uitgeverei van Gorkum

Tester, K. (1991): Animals and society. London: Routledge

Thenail, C., P. Dupraz, M. Pech, N. Turpin, G. Ducos, L. Wincler, P. Barillé, A. Joannon (2009): How Do Farms Economic and Technical Dynamics Contribute to Landscape Patterns? In F. Brouwer, C.M. van der Heijde: Multifunctional Rural Land Management: Economics and Policies. London: Earthscan

TND Emnid (2015): Akzeptiertes Töten von Tieren. https://static3.evangelisch.de/get/ccd/1FmeQ3l4IC4qX8C3Atv1oJTk00108260/download (Feb 11, 2020)

Twine, R. (2017): A Practice Theory Framework for Understanding Vegan Transition. Animal Studies Journal 6 (2) 192-224

Umweltbundesamt (2019): Grünlandumbruch. https://www.umweltbundesamt.de/daten/land-forstwirtschaft/gruenlandumbruch#gefahrdung-des-grunlands (Feb 19, 2020)

Van Zanten, H.H.E., B.G. Meerburg, P. Bikker, M. Herrero (2016): Opinion paper: The role of livestock in a sustainable diet: a land-use perspective. Animal 10 (4) 547-549

Vanhohacker, F., E.J. van Loo, X. Gellynck, W. Verbeke (2013): Flemish consumer attitudes towards more sustainable food choices. Appetite 62 (1) 7-16

Vellinga, T.V., A. van den Pol-van Dasselaar, P.J. Kuikman (2004): The impact of grassland ploughing on CO2 and N2O emissions in the Netherlands. Nutrient Cycling in Agroecosystems 70, 33-45

Visak, T. (2007): Vegan agriculture: animal-friendly and sustainable. In W. Zollitsch, C. Winckler, S. Waiblinger, A. Haslberger: Sustainable food production and ethics. Wageningen: Wageningen University Press

Visak, T. (2013): Killing Happy Animals: Explorations in Animal Ethics. London: palgrave

Wells, M.L., P. Potin, J.S. Craigie, J.A. Raven, S.S. Merchant, K.E. Helliwell, A.G. Smith (2017): Algae as nutritional and functional food sources: revisiting our understanding. Journal of Applied Phycology 29 (2) 949-982

Wikipedia (2020): Vegetarianism by Country. https://en.wikipedia.org/wiki/Vegetarianism_by_country (Feb 11, 2020)

Xu, L.Y., M.Y. Wang, X.Z. Shi, Q.B. Yu (2018): Effect of long-term organic fertilization on the soil pore characteristics of greenhouse vegetable fields converted from rice-wheat rotation fields. Science of the Total Environment 631-632, 1243-1250

Xu, Y.C., Q.R. Shen, W. Ran (2003): Content and distribution of forms of organic N in soil and particle size fractions after long-term fertilization. Chemosphere 50 (6) 739-745

Yu, X.-D., T.-H. Luo, H.-Z. Zhou, J. Yang (2007): Distribution of Carabid Beetles (Coleoptera: Carabidae) Across a Forest-Grassland Ecotone in Southwestern China. Environmental Entomology 36 (2) 348-355

Sciforum-031274: Transformations towards food sustainability: A transdisciplinary method for collective action in Latin America and Africa

Aymara Llanque Zonta[1], Johanna Jacobi[2]

[1] COMPAS CDE UNIBE

[2] CDE UNIBE

We are facing a global food crisis: the percentage of people with malnutrition increases, along with devastating results for the socio-ecological environments, pointing to the limitations of the currently dominant food systems. The need to address a complex set of food-related problems requires multidimensional perspectives at all stages of the supply chain, from production, processing, distribution, sale, consumption and waste. The present study investigates transdisciplinary methods to analyze how transformations towards food system sustainability work. These "food sustainability transformations" implemented in the frame of a "Swiss r4d" project foster the participation of different actors who are interested in the sustainability of the food system they are connected to. Food sustainability transformations also aim at elevating successful approaches towards political spaces, where decision-makers play a fundamental role in the advocacy for changes. In five years of transdisciplinary action-research in six countries, we co-created a tool to collectively analyze and transform food systems with the aim to improve food security, the implementation of the right to food, increase resilience, reduce poverty and inequality, and reduce negative environmental impacts. Through the application of this participatory "Food Sustainability Assessment Framework" (FoodSAF), we developed pathways for transformation processes, and implemented collective actions at different levels. Our results show that transformations become possible when a range of different stakeholders who are interested in improving the sustainability of their food systems collectively deliberate, and implement specific actions, which are usually part of larger, already ongoing processes. At the local level, significant changes were achieved in the short term. However, the possibilities of transformation depend on the context where they occur: For instance, when regulations put pressure on local food systems, or market prices are too low to make a living from farming. However, environments with scarce water or degraded soils hinders the continuity of small-scale production systems. Through policy commendations, local transformation actions can also influence other scales such as regional, national and global levels.

Sciforum-031200: Transformative collective action to change the legislation prohibition raw milk cheese in Seara, Santa Catarina, Brazil

Andréia Tecchio[1], Aymara Llanque Zonta[2], Johanna Jacobi[3], Adriana Bessa[4]

[1] Federal University of Santa Catarina, Brazil

[2] COMPAS-Bolivia,

[3] University of Bern

[4] Geneva Academy for International Humanitarian Law and Human Rights

The municipality of Seara in Santa Catarina, southern Brazil, is known for its family farming landscape and food traditions. Nowadays, a significant part of agriculture is industrialized by large agro-industrial meat corporations for export. Part of the agricultural landscape is managed by small family businesses or cooperatives in diversified agroecological farming systems. One traditional food product of this region of socio-cultural and economic importance to family farmers is raw milk cheese. However, state legislation criminalizes raw milk and other family farming products by prohibiting them. Routine tests show that raw milk cheese in Seara does not pose any health risk if handled properly. Recently, raw milk cheese has been promoted by small cooperatives, public institutions and civil society organizations such as Slow Food. In 2019, they also received support of the transdisciplinary Swiss r4d project "Towards Food Sustainability: Rebuilding the Coexistence of Different Food Systems in South America and Africa". Through the application of the theoretical framework of food sustainability of the R4D Project, a multi-stakeholder group identified that the main problem of the productive system was commercialization, since the legislation poses family farmers in a severe disadvantage by prohibiting them to sell their products. In addition, there is resistance from the municipal government regarding the recognition of the existence of family farming as a productive system. The objective of the transformative collective action in Seara was to develop and stregnthen a strategy used by family farming organizations to change the regulations regarding raw milk products. All actions targeting public awareness and eventually policies were collectively decided and organized among farming families that produce raw milk cheese, and a team which was composed of institutions that support family farming in Seara. The actions consisted of cheese competitions, meetings with the executive and legislative branches of Seara, information events with state representatives, and active participation in the working group that discusses food and agricultural legislation at the national and state levels. The main result was the self-organization of the diferent actors advocating for a new legislation on raw milk cheese. The law on raw milk cheeses was eventually changed, and a proposal for a new law was sent to the municipal government. The main challenge is now to keep local actors mobilized to ensure proper implementarion of the changed law. The next goal is to take the discussion of the national level, since the legislation for raw milk cheese is also unfavorable in other parts of the country.

Sciforum-034046: Urban Food Footprints: assessing food impacts and policy gaps in Portugal

Alessandro Galli[1], Sara Moreno Pires[2], Katsunori Iha[3], Armando Abrunhosa Alves[2], David Lin[3], Maria Serena Mancini[1], Filipe Teles[2]

[1] Global Footprint Network, Avenue Louis-Casaï, 18, 1209 Geneva, Switzerland

[2] GOVCOPP, Department of Social, Political and Territorial Sciences, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

[3] Global Footprint Network, 426 17th Street, Suite 700, Oakland, CA 94612, USA

Cities, as population hotspots and place of consumption for most of the food produced worldwide, will increasingly play a central role in food sustainability as they represent both a problem and an opportunity for sustainable food solutions. Based on ongoing research in Portugal, here we investigate food impacts and the role of policies in cities. The current sourcing and resource intensities profiles of dietary patterns at Portuguese national and city level is discussed through the use of Ecological Footprint Accounting. A policy framework for evaluating local food system policies is proposed and assessed in six Portuguese cities, to understand critical policy gaps to accomplish a transition towards sustainable food systems.

Our findings demonstrate that in Portugal, a country characterized by high meat and fish consumption, dietary choices represent the main (≈30%) driver of the Ecological Footprint. In addition, we have found critical deficiencies in local food policy implementation and weak political commitment, coordination, and institutional capacity. Food policies – especially at the local level – are still not prioritized and similarities with other countries within Europe and their implications are also discussed.

Sciforum-031265: Worksite intervention to reduce food waste among employees

Luca Secondi[1], Ludovica Principato[2], Giovanni Mattia[2], Luca Ruini[3]

[1] UNIVERSITY OF TUSCIA

[2] University of Rome Tre

[3] Barilla S.p.A.

Reducing food waste is a major challenge to achieve a more sustainable food system, that is why its halving have been included in the UN Sustainable Development Goals. The majority of food waste happens at consumer level, but although several individuals have lunch in worksite canteens, few studies focused on this particular situation and analyse how food waste reduction in this context can be a win win solution for company budget, individuals themselves and ultimately for the environment.

In this study we analysed data from the Barilla Company canteens where a large number of employees have lunch every day. The main aim is to show that a worksite intervention aimed at reducing employees' food scraps can lead to less food waste and relevant economic savings for the company. Specifically, the implemented actions referred to accurate daily measurement of food waste with the identification of areas with high level of food waste and the consequential reduction during the studied period, the constant spread of updated reports with precise quantification of waste, saved-plate and donations thus promoting a greater level of sensitivity towards sustainability throughout the company.

The encouraging results for the year 2019 show a reduction of 3.9 tons of wasted food, 17 tons of CO_2 emissions and 9776 equivalent saved meals, therefore supporting the progress of the project in undertaking customer awareness strategies, proposing ideas to the kitchen team for reducing waste and continuing to constantly monitor the situation through frequent meetings to share strengths and improvement points.

Sciforum-029483: Zombie attack! Using scientainment to teach about sustainable food

Petra Bättig[1], Rahel Meier[2], Verena Berger[2]

[1] ZHAW

[2] ZHAW Wädenswil

The Zombie attack is a cross between a digital treasure hunt and an escape room mission. Using their personal smart phone, small groups of 1-4 persons can solve riddles in a race against time, trying to find the hidden formula of the vaccine. The information necessary for the correct answers can be found in our campus' garden, which showcases our research in the area of sustainability. While the story is purely fictional, the information required to solve puzzles is not. Thus, while enjoying a mysterious, fun story and trying to help save the world from a zombie invasion, players learn important facts about sustainable food.

The Zombie attack is a scientainment approach, a low-threshold approach to communicating by cleverly combining entertainment and knowledge transfer. In addition to the factual content, importance is attached to the presentation of the content in a way that appeals to positive emotions and is suitable for the target group – adding excitement, surprise, mystery and fun. While many classic sustainability communication programs mostly address audience with a pre-existing interest in sustainability, scientainment can help address new audiences with no interest in science or sustainability.

The starting point of the project was a precise impact orientation, defining the key messages and recommendations for action based on the desired outcomes and impacts and an analysis of the relevant target groups. The first feedbacks are promising. An evaluation with school classes using questionnaires and interviews had to be postponed due to the pandemic. Research questions will include: Do they learn new facts about sustainable food? Does a pre-existing interest in sustainability or in science influence the learning effect?

Sciforum-036350: Promoting Gender Inclusive Participation for a Sustainable Production of Root and Tuber Crops in West Africa

Justin Pita

[1] Central and West African Virus Epidemiology (WAVE), Université Félix Houphouët-Boigny, Côte d'Ivoire

West Africans depend more on cassava for their daily calories than any other crop, and the crop is critical to the livelihoods of many rural farmers. An outbreak of severe cassava disease for example by the incursion of the Cassava Brown Streak Disease (CBSD) or by the emergence of more severe strains of African Cassava Mosaic Disease (ACMD) in any West African country, will not only create a disaster for root crop farmers, who are mainly women, but could also destabilize the entire region. Therefore, to prevent the development of potential pandemics, it is imperative to pre-emptively manage the viral diseases of cassava with a holistic approach by involving the critical actors who are mainly women. Indeed, while women are critical players across West Africa's cassava value chains, they remain at the margins of power and decision making especially in agricultural research leadership, where priorities for agricultural research are set, resources are allocated, and policy decisions made. Consequently, assuring gender inclusive participation in the fight against cassava diseases could reduce food insecurity significantly in the region.

Sciforum-036135: Towards a conceptual framework for gender and the African food system using international and continental agreements

Elizabeth Mkandawire

[1] University of Pretoria

Globally, women are disproportionately affected by food insecurity, yet they play a fundamental role in household food security and nutrition. The multiple roles women play in various areas of the food system are not always recognised. This oversight emerges from an overemphasis on one aspect of the food system, without consideration for how this area might affect or be affected by another aspect. Using content analysis, this study aimed to draw on international commitments and treaties to move towards the development of a food systems framework that integrates a gender perspective. The study found that there is generally consensus on specific actions that can be taken to advance gender equality at specific stages of the food system. However, governance and social systems constraints, that are not necessarily part of the food system, but have a significant bearing on women's capacity to effectively participate in the food system need to be addressed. While the proposed conceptual framework has some limitations, it offers a foundation on which researchers, policymakers and other stakeholders can begin conceptualising the interconnectedness of gender barriers in the food system.

Sciforum-036136: Strategies for Building Climate Resilience into African Agricultural Systems

Andy Dougill

[1] Executive Dean, Faculty of Environment, University of Leeds, UK

This talk presents recent empirical research from across sub-Saharan African farming systems (notably in Malawi, Tanzania, Kenya & Ghana) evaluating key actions capable of enhancing climate resilience in rainfed agricultural systems. It highlights the additional insights and impacts from active community engagement in monitoring of soil health and through improved communication systems for weather and climate information.

Studies show that Climate-Smart Agriculture interventions, such as Conservation Agriculture (CA) in lowland settings or Soil & Water Conservation (SWC) in highland Africa, can significantly improve soil structure and thus water & nutrient retention enhancing resilience to both heat stress and dry spells. Findings also show that in many contexts, the full potential benefits of CA & SWC are not realised due to low levels of farmer adoption, dis-adoption after a short project cycle and/or due to poor management of crop residues. Improved extension advice utilising local and scientific knowledge is essential to enable more sustainable land management practices across Africa.

Improved modelled prediction of future weather (on hourly to seasonal timescales) and its direct impacts on agricultural systems offers a significant opportunity to improve communication flows to farmers capable of enhancing crop productivity and climate resilience. Translation of weather forecast information into locally-appropriate impact forecasts and action-based agricultural extension advice can improve seed selection choices and land management practices.

It is vital that cross-sectoral, multi-stakeholder partnerships are established nationally and sub-nationally to integrate the new opportunities (from improved climate, soil and crop information) with traditional knowledge of agricultural communities across the continent.

Sciforum-036137: Africa's food crops potential beyond the myths

Cheikh Mbow

1 Director, Future Africa Institute, University of Pretoria, South Africa

Achieving food security under the resource-poor conditions of Africa requires the use of all potential food sources. The neglected species in Africa have a huge untapped potential. In the semi-arid regions of Africa, e.g. the Sahel and the Southern Africa semiarid lands, the use of native, nutritious plants has been an important asset for food security, particularly during the mega-drought period and seasonally to compensate for temporal food deficit. With emerging "modern" agriculture, the set of the crop used is often reduced to three major ones (rice, maize, wheat), while Africa has a large diversity of plants that are the source of healthy food and could help reduce the food and nutrition deficit in climate-sensitive areas. This presentation will share some evidence showcase how to accelerate food production from the perennial staples and other annual neglected plants of Africa to improve diet and vulnerable people's adaption to climate change.

Sciforum-036138: Harnessing innovative technologies for sustainable food production in Sub-Saharan Africa: Challenges and opportunities

Felix D. Dakora

[1] Chemistry Department, Nitrogen Fixation Laboratory Tshwane University of Technology, Arcadia Campus Private Bag X680, Pretoria 0001, South Africa

The major constraints to increased food production in Sub-Saharan Africa include inherently low soil fertility, insect pests/diseases and climate change. While chemical fertilizers can be used to increase crop yields, they are expensive and inaccessible to resource-poor farmers in Africa. Additionally, they can pollute the environment and increase the carbon footprint with continued manufacture and frequent use in agriculture. Soil bacteria called rhizobia can form root nodules and fix N_2 with most grain legumes. Thus, N_2-fixing legumes can meet a high proportion of their N nutrition from the atmosphere, and their inclusion in cropping systems can contribute significantly to increased crop yields and improved soil fertility through legume/cereal rotations. Exploiting the legume/rhizobia symbioses can therefore address the problem of inherently low nutrient fertility of African soils. Climate change is another challenge that has caused frequent droughts and flooding in Sub-Saharan Africa, often leading to loss of crops and animals. This can also be mitigated through the development of crop varieties that are tolerant of drought or flooding. Additionally, the development of early-maturing crop varieties that can grow and produce economic yields for household food security within a short rainy season is highly desirable. Insect pests such as aphids and pod borers can also destroy field crops and cause food insecurity in Sub-Saharan Africa. These can be controlled through breeding of pest-resistant varieties. Even the desert locust, whose periodic outbreak in Sub-Saharan Africa has ravaged field crops and existing natural vegetation thus causing food insecurity, can be bio-controlled using emerging technologies.

Sciforum-036139: Guiding Nutritious Food Choices and Diets Along Food Systems

Hettie C Schönfeldt

[1] Department of Animal and Wildlife Sciences, University of Pretoria, South Africa

Poor diets are responsible for more of the global burden of ill health than sex, drugs, alcohol, and tobacco combined. Without good health, food security, and nutrition, development is unsustainable. How food is grown, distributed, processed, marketed, and sold determines which foods are available, affordable, and acceptability within the local cultural context. These factors guide food choices, influencing the quality of people's diets, and hence play a vital part in health. The food system is complex and is neither nutrition nor food driven. Nutrition and human health are not seen as important supply chain issues, diminishing between the different processes and actors in the chain. This is in contrast to the environmental and labour concerns now also perceived as supply chain issues. In a free market dispensation, the trade-offs between agricultural production and income generation vs nutrient delivery from farm to fork needs to be addressed. Invest and incentivised initiatives to foster diverse food production, influence consumers' behaviour and consumption. The decisions made at any stage of the food supply chain have implications on consumer choices, dietary patterns, and nutritional outcomes. Leveraging the entire food system is an underused policy response to the growing problem of unhealthy diets. Two concrete priorities to guide action are: (i) improve the physical and economic access to healthy and sustainable diets; and (ii) strengthen consumers' information and education to enable healthier food choices.

Sciforum-036140: Understanding barriers to institutionalization of gender within agricultural research and higher education in Africa

Margaret Najjingo Mangheni

[1] College of Agricultural and Environmental Sciences, Makerere University

Agricultural research and higher education institutions which are key pillars of Africa's food systems have insufficient capacity to promote gender inclusive pathways out of poverty for the 50% of sub-Saharan smallholder farmers who are women. Despite decades of gender sensitization, training, policy and strategic focus, gender inequalities continue to thrive in these institutions. Gender positive policy statements are under-funded, sporadically implemented, and compartmentalized without institution-wide transformation. An understanding of underlying factors explaining the limited success would inform strategies for genuine transformation. The paper draws on literature and case studies of various African organizations to discuss three barriers explaining the ineffective gender institutionalization within agricultural research and higher education: (i) Individual based as opposed to institutionally driven approaches to gender integration efforts with a heavy reliance on champions and external donors as opposed to institutional structures (ii) Organizational structures are around agricultural commodities or disciplines with emphasis on biophysical agricultural sciences hindering interdisciplinarity and recognition of the contribution of gender and other social sciences. (iii) There is insufficient empirical evidence to demonstrate the value add of integrating gender in mainstream agricultural research and higher education. Transformation needs to start with key decision makers in research and higher education so that they are convinced to prioritise the necessary reforms in organization structures with attendant financial and human resources supported from national budgets. For this to happen, credible empirical evidence of the social and economic cost of gender blindness to African food systems is key.

Sciforum-036141: Re-Imaging Risk Food System Change in the Post - COVID-19 Context

Julian May

[1] Director, DSI-NRF Centre of Excellence in Food Security, UNESCO Chair in African Food Systems, University of the Western Cape

[2] Researcher and Network Learning Lead, ARUA-UKRI GCRF Food Systems Research Network for Africa (FSNet-Africa), University of Pretoria

Serious illness and injury are common and important sources of poverty producing shocks that result in food insecurity and malnutrition. These have significant negative impacts on welfare, especially for the poorest, driving up expenditure on health care, reducing capabilities for productive and reproductive activities, and decreasing capacity to manage climate and other changes. This is especially pertinent for most of sub-Saharan Africa in which the high prevalence of communicable diseases such as HIV/AIDS and malaria lead to repeated health shocks. Unusually, the prevalence of these illnesses results in their impact being similar to those of covariate shocks, increasing the risk of poverty for entire communities and reducing options for coping strategies. Livelihood disruptions arising from the COVID-19 pandemic may well have similar consequences for African food systems. The pandemic is likely to exacerbate existing dynamics of risk, and to introduce new and unanticipated changes to food systems within Africa. Although the initial focus of governments will be on public health interventions, preserving and growing resilient food systems will be critical if livelihoods are to be protected. This paper discusses the implications of these evolving forms of risk and uncertainty for sustainable African food systems, reflecting on lessons from other systemic shocks.

Sciforum-036142: Group/Village Aggregation Centers: Strategy for Food Loss Reduction and Better Market Access for Smallholder Farmers

Jane Ambuko

[1] jane.ambuko@uonbi.ac.ke

It is estimated that one third of the food produced for human consumption is lost along the supply chain while at the same time more than 820 million people are hungry. Food loss and waste (FLW) symptomizes an inefficient and inequitable food system with negative impacts on food and nutrition security and the environment. Specifically, the negative impact of FLW refer to the reduced availability and access to food and a longer-term effect through unsustainable use of natural resources on which the future production of food depends. Reduction of FLW is high on the global agenda for sustainable development. Specifically, Sustainable Development Goals (SDGs) 12.3 calls for halving of per capita global food waste (retail and consumer levels) and reduction of food losses along the supply chain. FLW reduction is also key on Africa's continental agenda of agricultural transformation as captured under the Malabo declaration (2014) to halve postharvest losses by 2025. Effective reduction of FLW require identification of the critical loss points in the supply chain and interventions with the greatest positive impact. Many reports have shown lack of on-farm storage and market access as key drivers to FLW and consequent food insecurity among smallholder farmers. Therefore, reduction of food loss through improved on-farm storage and market linkages could have a significant positive impact on the food security status of the farming households in rural areas in Africa. There have been concerted efforts and strategies to reduce on-farm food losses in various value chains. This paper examines the group/village aggregation centers approach to FLW reduction among smallholder farmers. The paper highlights two cases studies in Kenya where application of simple storage technologies for grains and perishable commodities (including fruits and vegetables) in aggregation centers have contributed to FLW reduction while enhancing access to market for the farming households. This strategy has shown great potential and can be scaled up to other commodities/value chains to realize the goal of reducing FLW.

Sciforum-036746: Developing a framework for African food systems research

Claire Quinn

[1] University of Leeds

Food systems encompass the activities and actors involved in all aspects of production through to consumption and disposal of food. A food systems approach recognizes the importance of interactions and relationships between activities/actors and thus the importance of interdisciplinary approaches and thinking. African food systems are comprised of many similar activities/actors to broader models of food systems, but also have activities, actors and conditions that are specific to the African context. While much research has focused on global food systems, relatively little attention has been paid to the particularities of African food systems, and the implications for how sustainable and robust they might be, now and in the future. Here I present the first steps towards a conceptualisation of African food systems within the FSNet-Africa project, how they are similar to and different from other systems globally, to begin identifying pertinent/pressing research gaps and potential leverage points for transformative change.

Sciforum-036559: Behavior and countermeasures for hazardous metals in paddy agroecosystem -Cadmium and arsenic as the primary targets

Tomoyuki Makino

[1] Tohoku University Graduate School of Agricultural Science / Faculty of Agriculture Laboratory of Soil Science

The rapid economic development and industrialization of emerging countries in recent years have caused pollution of agricultural land by hazardous metals, which is threatening food safety. The Codex Alimentarius Commission, belong to FAO and WHO, has recently adopted maximum permissible levels for cadmium (Cd) of 0.4 mg kg^{-1} in polished rice, and inorganic arsenic (iAs) of 0.2 mg kg^{-1} and 0.35 mg kg^{-1} in polished and husked rice, respectively. Given that 34–50% of Cd intake and 62% of iAs intake by Japanese people comes from rice, elucidating the behavior of Cd and As in agroecosystem of paddy field and reducing the concentrations of Cd and As in rice grains are high priorities in Japan and Asian countries in which rice is eaten as a staple crop.

This presentation provides an overview of our session stream. The first presentation will focus on behavior and countermeasures for hazardous metals, primarily focusing on Cd and As, in paddy agroecosystem in terms of soil to plant transfer. Cd and As show a trade-off relationship during waterflooding management in paddy soils.

The 2nd presentation will give the forefront of risk assessments of toxic trace metals in paddy soils. Cadmium and thallium are occluded by manganese oxides and bound to be released due to the dissolution of manganese oxides through soil drying. That's why soluble cadmium and thallium contents in soils are increased.

The 3rd presentation will show newly developed rice cultivar (KK1) that has nearly cadmium (Cd)-free grains shows a relatively low absorptive ability for soil manganese (Mn) because of the inactivation of the OsNramp5 transporter gene that transports both of Cd and Mn. This session reveals the characteristic of transfer between soil and plant on various metals such as Cd, Mn and Fe in comparison between KK1 and normal rice.

The 4th presentation will present the effects of mixing Andisol with alluvial soil on arsenic concentration in brown rice and elucidation of its mechanism. Andisol is widely distributed in Japan and contains a lot of active iron, which provides high adsorption activity on oxoacids such as arsenate and arsenite.

The final presentation will show a promising countermeasure to simultaneously mitigate the concentration of arsenic (As) and cadmium (Cd) in rice. One of the options is to use silica materials, but comprehensive research on a wide variety of materials are insufficient. This study analyzed elution characteristics of the commercially available materials and elucidated the relationship between the elution characteristics and As, and Cd concentrations in rice plant.

Sciforum-036563: Effects of soil drying on the chemical form of cadmium and thallium related to manganese

Takahiko Narukawa

[1] Graduate School of Agricultural Science, Tohoku University

【Introduction】

The Codex Alimentarius Commission, belong to FAO and WHO, has recently adopted maximum permissible levels for Cadmium (Cd) in rice (0.4 mg kg^{-1}). Thallium (Tl) is one of the hazardous metals as well as Cd and is readily absorbed by crops. In Switzerland and Germany, maximum permissible levels for Tl in soil is set to 1 mg kg^{-1}. Thus, Cd and Tl are important metals in terms of food safety. On the other hand, manganese (Mn) oxides are associated with heavy metal cations in soil due to its high adsorption activity caused by surface hydroxyl groups. For an example, layered Mn(Ⅳ) oxides, such as birnessite, oxidize Tl(Ⅰ) to Tl(Ⅲ) and Tl(Ⅲ) is strongly adsorbed onto Mn oxides (Sivan Wick et al. (2019). Some researchers, however, have pointed out that dissolution of Mn oxides with soil drying. Makino (1997) suggested that cobalt (Co) occluded by Mn oxides dissolved at the same time as the dissolution of Mn oxides. Xiang et al. (2010) reported the exchangeable fraction of Cd increased by air-drying of soil. These results suggest soil drying could be influential factor for heavy metals behavior. The purpose of this study is to investigate the chemical form changes of Cd and Tl related to dissolution of Mn oxides through soil drying.

【Materials and methods】

We conducted sequential extraction method using field-moist soils and air dried soils of 13 types soils. Exchangeable fraction(Soil : Solution=1 : 10, shaking for 1 hour), acid soluble fraction(Soil : Sol=1 : 10, shaking for 24 hours) and Mn oxides occluded fraction(Soil : Sol=1 : 50, shaking for 30 minutes) were extracted with 1 M NH_4NO_3 (pH 7.0), 0.44 M CH_3COOH (pH 2.8) and 0.1 M NH_2OH・HCl (pH 2.0) respectively. The concentrations of Mn in the sample solutions were determined by means of Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES), while concentrations of Cd and Tl were measured by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

【Results and discussions】

Comparing results of field-moist soils and air-dried soils, Mn oxides occluded fraction of Mn, Cd and Tl contents decreased, and contents of exchangeable fraction of Mn, Cd and Tl increased by air-drying of soil. Although acid soluble fraction of Mn and Cd contents increased, but acid soluble fraction of Tl contents decreased by air-drying of soil. Therefore, due to dissolution of Mn oxides through soil air-drying, Mn oxides occluded fraction of Cd may have been eluted and adsorbed weakly on surface of silicate clay minerals (exchangeable fraction) or strongly on hydroxyl groups of oxides such as Fe, Mn, Al (acid soluble fraction). Except for Acid soluble fraction, the same tendency was observed in the chemical form of Tl. The increase of exchangeable Tl associated with soil air-drying has not been reported before. Makino (2000) suggested that exchangeable Mn and Co increased in field drying condition. Thus, soil drying in field may induce the increase of exchangeable Cd and Tl. The mechanism for the reduction of acid soluble Tl requires further investigation.

Sciforum-036574: Absorption characteristics of manganese and iron in low Cd absorption rice cultivar compared to wild type

Rei Saito

[1] Graduate School of Agricultural Science, Tohoku University

In previous research, a japonica rice cultivar (Oryza sativa L. cv. Koshihikari Kan No.1 = KK1)) that is a mutant with nearly cadmium (Cd)-free grains was produced. It also shows a relatively low absorptive ability for soil manganese (Mn) because of the inactivation of the transporter-encoding gene (OsNramp5) that transports Cd and Mn and is susceptible to brown spot disease compared to Normal cultivar (Koshihikari =KK). Iron and manganese are both transition metals that exhibit similar behavior in paddy fields, where they are dissolved by reduction of the soil in response to waterlogging. The objectives of this study are to determine appropriate methods for soil-Mn availability for KK1 and to clarify the difference in Mn absorption property between KK1 and KK.

We collected shoot sample sets of KK1 and KK with soils in Japan. Available Mn of the soils were determined by the extraction methods with ammonium acetate, calcium chloride, hydroquinone, tannic acid, EDTA and DTPA followed by ICP-OES analysis. The latter three extraction solvents are also used to analyze soil Fe availability. Shoots were decomposed by an acid digestion method, and Mn and Fe were measured by ICP-OES.

KK1 had linear correlations between available soil Mn and shoot Mn with the decreasing of determination coefficients as follows: calcium chloride, DTPA, EDTA, ammonium acetate, tannic acid, hydroquinone. The top three solutions showed a high correlation significantly, suggesting the suitability of those methods to determine soil Mn availability for KK1 ($R^2 \geqq 0.6$).

On the other hand, the high correlations were not observed on KK in contrast to KK1. This difference could be attributed to the strong ability of KK to absorb soil Mn at low Mn concentration. The transfer factor of Mn showed a great difference between KK1 and KK, especially in the range of low concentration of soil Mn. KK1 showed a constant value of the transfer factor regardless of the soil Mn concentration, while KK showed a very high value at the low concentration and decreased exponentially with the increase of soil Mn concentration. These results suggest that the Mn transporter(OsNramp5) has so strong affinity with soil Mn that transports Mn effectively in low soil Mn range.
In terms of Fe absorption characteristics of both cultivars, the Fe transfer factors are high in the low soil Fe concentration range and gradually decreases as soil Fe concentration increases in both cultivar as observed in Mn behavior in KK. The manganese transfer coefficient of KK1 is thought to be specifically linear.

This research was supported by grants from the Project of the NARO Bio-oriented Technology Research Advancement Institution（Research program on development of innovative technology)

Sciforum-036577: Effects of mixing Andisol with alluvial soil on arsenic concentration in brown rice and elucidation of its mechanism

Shinji Yawata

[1] Graduate School of Agricultural Science, Tohoku University

【Background and objective】

The Codex Alimentarius Commission has recently adopted maximum levels for inorganic arsenic. Hence, the reduction of arsenic (As) concentration in brown rice has become an urgent issue. In paddy fields of Andisol, As concentration in brown rice tends to be lower than that in alluvial soil. The mechanism, however, has not been elucidated to the best of our knowledge. The chemical factors in soils related to As absorption by rice plant are as follows : (1) in flooded condition, arsenite (As(Ⅲ)), the main chemical species is adsorbed to soils or eluted in soil solutions (2) the amount and chemical form of iron (hydr)oxide which is an As adsorbent, and (3) silicic acid which competes with As(Ⅲ) on rice roots. The objectives of this study are to verify the effect of mixing Andisol with alluvial soil on As concentration in brown rice, and elucidate its mechanism based on the three points above.

【Materials and Methods】

Rice pot cultivation: Soil was prepared by mixing 0-20 wt% of allophanic Andisol with alluvial soil, and soluble As concentrations in these soils were similar（1.79, 2.10 mg/kg, respectively：1 M HCl-extractable As）.Then, japonica rice（*Oryza sativa*. L. cv. Hitomebore）was cultivated in pots under continuous flooding condition. Soil solutions were collected during the cultivation period and analyzed for dissolved As and Si concentrations. Total As concentration in brown rice were determined by an acid digestion method.

Arsenic adsorption experiment: As(III) solutions prepared in several concentrations were added to the soil（reduced soil）that had been incubated under flooded condition for 120 days or more, and then the As concentration in the equilibrium state was measured. Furthermore, the reduced soil was extracted with acetate buffer solution, which was adjusted to pH 3.0, and ferrous iron in the solid phase was measured. Poorly crystalline Fe（Feo）was extracted by acid ammonium oxalate. As and silicic acid were measured by ICP-MS and ICP-OES, respectively, ferrous iron was analyzed by spectrophotometer using o-phenanthroline as a coloring reagent, and Feo was analyzed by atomic absorption spectrometer.

【Results and discussion】

Compared with the control, the 10 and 20% of Andisol mixed plots showed a significant decrease in the total As concentration in brown rice (21-29%). Also, as the proportion of Andisol in the pot soil increased, the As concentration in soil solution 10 days before heading tended to decrease and the Si/As ratio in soil solution tended to increase. In addition, as a result of the adsorption test, Andisol had much more As adsorption capacity than alluvial soil, and also a lot of amorphous iron (hydr)oxide remained under reduced condition. Based on the above, Andisol has the following characteristics: (1) As(III) adsorption capacity is large under reduced condition, (2) amorphous iron (hydr)oxides are sufficiently retained, (3) the relative amount of silicic acid to As in soil solutions increased. These three factors contributed to the reduction of As concentration in brown rice by mixing Andisol.

Sciforum-036582: A comprehensive analysis of the mitigation on cadmium and arsenic in rice plants by various silicate materials produced in Japan

Hiroshi Takenaka

[1] Graduate School of Agricultural Science, Tohoku University

In recent years, Codex Alimentarius Commission has instituted the maximum level of arsenic (As) and cadmium (Cd) in rice, so we have to reduce both of them simultaneously. While silica materials applying to soils can be concerned for the answer, the comprehensive research on a wide variety of the materials, sold commercially in Japan, is insufficient. It should be clarified how successive years application of the materials effects on Si in soil solution, and As/Cd mitigation and healthy growth of rice plant. The purposes of this study are to analyze elution characteristics of the commercially available materials and to elucidate the relationship between the elution characteristics and As, and Cd concentrations in rice plant.

The amount of available silica in 31 materials was determined by an extraction method with a weakly acidic cation exchange resin in water, followed by the selection of 14 materials, covering the different levels of the available silica, for pot cultivation test under continuous flooding condition. The 0.02 m^2 Wagner pot was used with 2.5 kg of medium coarse gray lowland soil (1 mol L^{-1} HCl extracted As: 2.0 mg kg^{-1}, 0.1 mol L^{-1} HCl extracted Cd: 0.3 mg kg^{-1}) and 5 g of the materials. We started the pot test with japonica rice (*Oryza sativa.* L. cv. Hitomebore) after the transplanting of rice seedling on Jun. 1, 2018. Furthermore, we conducted additional pot test by using two selected silica materials, in which soil pH was changed by adding alkali or acid in 2019. The concentration of Si in soil solution at heading stage was measured by ICP-OES. Si in shoots was determined by a weight method. Total As and Cd in shoots and brown rice were measured by acid digestion followed by ICP-MS. Inorganic As in brown rice was determined by HPLC-ICP-MS.

Available silica of materials is 17.3 to 340.3 mg SiO_2 g^{-1}, showing a wide range of Si content in the materials. The Si concentration in soil solution positively correlated with the available silica, which indicates the determination method of available Si is useful and the elution characteristics is various in Japanese silica materials. The Si concentration in shoots was positively correlated with that in soil solution, so it is speculated that the eluted silica was effectively taken into the plant. Besides, the total As concentration in shoots significantly decreased along with the increase of Si concentration in soil solution, while it shows similar tendency with a relatively low mitigation for the total and inorganic As concentration in rice grain. These results suggest that the mitigating effects, thought to be a competitive absorption between silicate and arsenite, have diminished during the transportation/distribution process of As in rice plant.

As for the soil pH effect, As concentration in brown rice increased when the soil solution pH was lowered by the addition of acid in which no silica material has been applied. This could attribute to the increase in As of soil solution with the dissolution of iron oxides. In contrast, it did not increase when the soil solution pH was lowered under silica material application. This is because a lot of Si was also leached from the material due to the decreasing of soil solution pH, and prevented the increase in As concentration in the brown rice by its competition to absorb with arsenite.

On the other hand, Cd concentration in brown rice was at low level sufficiently, probably due to the flooding condition. The results obtained here are from the first year of successive materials application. In the future, we would like to advance analysis of the accumulation effect by successive application of materials.

Abstracts

Session 2. Transport and Mobility

Sciforum-029963: Cost Estimate Integration with Life Cycle Cost Analysis for Sustainability of Highway Infrastructure California-USA

Eul-Bum Lee[1], Chang-Mo Kim[2], Ghazan Khan[2], Sin-Ae Jang[3]

[1] Graduate Institute of Ferrous Technology and Department of Industrial Management Engineering, Pohang University of Science and Technology (POSTECH), South Korea

[2] Department of Civil Engineering, California State University, Sacramento, USA

[3] Graduate Institute of Ferrous Technology and Department of Industrial Management Engineering Pohang University of Science and Technology (POSTECH), South Korea

Life-Cycle Cost Analysis (LCCA) is a decision-making tool to determine the least-cost (cost-effective) option among different competing alternatives through evaluating the total cost of an investment over its entire lifetime. The California Department of Transportation (Caltrans) utilizes LCCA to study pavement investment alternatives on California highway projects. Caltrans' LCCA, RealCost 2.5CA, requires a unit price per material to calculate the agency costs of future maintenance and rehabilitation (M&R) projects. The RealCost procedure manual guides users to use statewide uniform unit prices as default or find relevant unit prices from the Caltrans historical contract cost database. However, the materials' unit price may vary due to other factors over time. The unit price entered by a user to calculate the future M&R project cost for a long-term LCCA period, typically 60 years, may result in inaccurate results if its variability over time is not considered. The purpose of this study is to investigate the sensitivity of materials' unit prices due to external components (project size, climate region, and other socio-economy variables) in the life cycle cost. The research team collected and investigated California materials' unit prices for M&R project and relevant socioeconomic variables over the past multiple decades. This analysis will be used to develop statistical models to predict material and construction-related cost inputs for future M&R projects to support accurate LCCA for sustainable California highway projects.

Sciforum-030828: A Study of Utilizing Big Data to Construct Sustainable City's Transportation Planning and Design Evaluation Model

Wann-Ming Wey

[1] Department of Real Estate and Built Environment, National Taipei University 151 University Road, San Shia District, New Taipei City, 23741, Taiwan Tel: +886-2-8674-1111 ext. 67428; Fax: +886-2-8671-5308

The rapid urbanization phenomenon has resulted in the increasing of motor vehicles popularity and thus causing an urban sprawl in most cities. In order to solve these deteriorating situations, how to use the concept of "sustainable development" in the process of urban development, and to find appropriate urban planning goals have become the focus of attention of all countries. The transportation problem needs to be considered its future situation and proposed the necessary strategies due to the characteristics of the continuous disturbance of urban transportation needs. On the other hand, in urban planning, in response to the popularization of computer and network technologies which has also led to the concept of applying information technology to urban management strategies. The huge amount of data (big data) connects the time and space in the development of the city, so that the torrent of urban planning has evolved from a situation that originally required long-term planning to a short-term and dynamic development. Compared with the past planning history, more emphasis is placed on long-term planning, and less discussion of what happens in cities within minutes or hours. Therefore, this study hopes to achieve long-term goals by exploring real-time and dynamic urban changes. This research is based on huge amounts of big data and further applied it to urban sustainable transportation strategies.

We will first review and analyze relevant literature, summarize the sustainable transportation indicators that meet the future cities, and prioritize the indicators with big data. Then combined with using Deep Learning and time series algorithm to predict future trend of the indicator. Secondly, Dynamic Network Process will be used for the priority evaluation of sustainable urban transportation strategies in the future under dynamic spatial and temporal changes; Finally, we will apply Multi-objective Optimization to find a better action plan for the allocation of various resources of future planning and design for transportation in cities to maximize social equity, maximize economic development, and minimize environmental damage. In this study, the novel research methods have created the main research core value of this research, which is used as an important reference and evaluation index basis for the development of future cities in Taiwan.

Sciforum-031021: Characteristics of Spatial Connection Based on Intercity Passenger Traffic Flow in Harbin-Changchun Urban Agglomeration, China

Rong Guo, Tong Wu, Xiaochen Wu

[1] School of Architecture, Harbin Institute of Technology; Key Laboratory of Cold Region Urban and Rural Human Settlement Environment Science and Technology, Ministry of Industry and Information Technology, Harbin,150001, China

With the continuous improvement of transportation facilities and information networks, the obstruction of distance in geographic space has gradually weakened, and the hotspots of urban geography research have gradually changed from the previous city hierarchy to the characteristics of urban connections and networks. As the main carrier and manifestation of elements' mobility such as people and material, traffic flow is of great significance for understanding the characteristics of spatial connection. In this paper, Harbin-Changchun agglomeration proposed by China's New Urbanization Plan (2014-2020) is taken as a research object. With the data of intercity passenger traffic flow including highway and railway passenger trips between 73 county-level spatial units in the research area, a traffic flow model is constructed to measure the intensity of spatial connection. Using social network analysis method, the characteristics of spatial connection of Harbin-Changchun urban agglomeration are analyzed, and the results are visualized with ArcGIS technique. The results show that the spatial connection of the Harbin-Changchun urban agglomeration based on traffic flow presents a distance attenuation effect that weakens in the directions of "Harbin-Daqing-Qiqihar-Mudanjiang" and "Changchun-Jilin-Tumen"; the direction of the connection clearly points to the Heilongjiang's provincial capital Harbin and Jilin's provincial capital Changchun, which proves that the agglomeration effect with Harbin and Changchun districts as the core is significant; the connection strength of Harbin or Changchun districts and other spatial units is the strongest, follow by Daqing, Qiqihar or Jilin districts and other spatial units. However, counties and cities in the border areas of Heilongjiang and Jilin provinces have the lowest connection strength with other counties and cities, indicating that there are obvious regional differences in the spatial connection level of the Harbin-Changchun urban agglomeration, and the connection nodes present a dual-core-edge hierarchical distribution. The research can provide support for the proposal of regionally coordinated sustainable development strategies of Harbin-Changchun urban agglomeration.

Sciforum-031256: Life Cycle Assessment of the future light duty vehicle fleet in the UK – taking stock of the co-evolution of the transport and energy sectors.

Mashael Kamran, Marco Raugei, Allan R. Hutchinson

[1] Oxford Brookes University

Limiting global temperature rise to 1.5°C relative to pre-industrialization conditions will require a concerted effort by all countries to move away from fossil fuels as their principal sources of energy, across all sectors. Specifically, the energy and transport sectors are jointly responsible for over 50% of the UK's carbon emissions. The UK government has therefore set a target to end sales of all conventional internal combustion engine light-duty vehicles (LDVs) by 2035, and to allow zero-emission vehicles potentially only across all segments by 2050. A second major change in the future of mobility is the likely gradual transition from vehicle ownership to transport-as-a- service (TaaS), such as ride-hailing services and ride sharing, to provide users with more flexible travel modes. This would reduce the overall vehicle fleet size, and hence the demand for raw materials, as well as traffic congestion. A widespread adoption of TaaS would then facilitate fleet operators' participation in grid services through smart charging and vehicle-to-grid (V2G) energy storage. The latter could play a key role in enabling the large-scale roll-out of variable renewable energy (VRE) technologies such as wind and solar photovoltaics in the UK's electricity grid, as projected in National Grid's "2 degrees" Future Energy Scenario (FES). This work presents a combined life cycle analysis, and discusses the energy and environmental implications, of three on-going transitions in the UK: (1) uptake of Electric Mobility in the LDV sector, (2) gradual shift from vehicle ownership to TaaS and (3) evolution of the electricity grid mix.

Sciforum-031363: Envisioning Transportation Corridors as an Integral part of Cultural Landscapes - A case of Ahmadabad, India

Namrata Shah

[1] CEPT University

The city of Ahmedabad is the only city on the bank of the river Sabarmati, originating from the Aravalli mountain in the state of Rajasthan to meet the Gulf of Khambhat in the State of Gujarat with a length of 370 Kilometers.

"*Men in space are enabled to look upon the distant earth, a celestial orb, a revolving sphere. He sees it to be green, from the verdure on the land, algae greening the oceans, a green celestial fruit. Looking closely at the earth, he perceives blotches, black, brown, gray and from these extend dynamic tentacles upon the green epidermis. These blemishes he recognizes as the cities and works of man and asks, "Is man but a planetary disease?*"" - The Cast and the Capsule, Design with Nature by IAN L. McHARG

The "cities" Ian McHARG mentions in the paragraph above represent an Individual's idea of a built environment that is unique to the region, climate, geography, demographics, biota, etc. I was delighted to read each word in the paragraph above until the author questions our habitat as a planetary disease. The blotches author perceives from the space are nothing but our own space in the world. One of the interesting ways to pursue the uniqueness of the city is to consider the mobility networks. The changing patterns of these networks have stories to tell: from the city's history and urban growth over the period to understand the cultural distinctiveness of a region and it's magnitude over an urban ecology. These patterns often are a response of social and economic situations of the times and thus create spaces that are complex yet most desirable in place making. Should a thoughtful design of a mobility corridor pass through a city be an integral part of a landscape that includes but natural resources, domestic and wild flora and fauna, weather patterns, social, cultural and economic elasticity, could lead us to meaningful human experience in an urban lifestyle? A multi-dimensional mobility system comprised of culture, nature and rapid transit can create a unique identity of its own. The following paper will be focusing on all three aspects of a built environment; culture, ecology, and transportation, to understand interrelationship amongst them. The proposal aims to provide a solution to the mobility corridor that sustains cultural ecology and economic differences.

Sciforum-032247: Mobility and intercultural diversity in intermediate urban systems of Latin America: An approach from the New Mobility Paradigm

Gonzalo Salazar

[1] Pontificia Universidad Católica de Chile, Instituto de Estudios Urbanos y Territoriales

Intermediate (medium size) cities have had a key role in urban dynamics and development in Latin America since the second half of the twentieth century. As these types of cities are part of intense scalar, urban-rural and intercultural/indigenous relations, they face complex challenges for their sustainable planning and governance. However, most of research on these urban systems have been reduced to static and demographic criteria, thereby overlooking the socio-spatial interactions and intercultural dynamics that configure their complexity. This has generated a significant shortcoming in urban sustainability planning and governance in the last decades. Based on the New Mobility Paradigm this work introduces a new methodological proposal, based on qualitative mobile methods, that contributes to understanding socio-spatial, intercultural and political dimensions of urban systems (particularly intermediate cities). An empirical application of the methodology is performed in Chile. Based on this application, the article provides conclusions regarding the theoretical and methodological approach necessary to attend to the socio-spatial complexity of intermediate cities in Latin America in intercultural contexts.

Sciforum-032556: Understanding citizen's aspirations for their cities' mobility and its relationship with acceptance of Autonomous Vehicles: A case study of Singapore

Samuel Chng

[1] Singapore University of Technology and Design

The ability to travel and move around is important for our daily lives and this is coming into the spotlight as its environmental impact of transportation is increasingly recognised by both experts and non-experts. New mobility technologies are being developed (e.g. autonomous vehicles, electric vehicles, etc.) and innovations in its mobility services have been introduced in many cities and countries in the last decade (e.g. ride-hailing, ridesharing, mobility-as-a-service, etc.) that has evolved our mobility patterns. While the industry and research community lead the way in these innovations and developments, it is also important to understand how they complement or diverge from the citizen's aspiration for their cities' mobility in the future. Hence this study focused on uncovering the extent to which the pursuit of autonomous vehicles is congruent with the citizens' mobility aspiration in the case of Singapore. Among the 210 participants, we found general acceptance of implementing autonomous vehicles in the city, though some concerns in the areas of technical-issues and legal liability were identified. Similarly, there was a strong preference (77% of participants) expressed for autonomous vehicles to be part of everyday mobility. About 60% of participants also expressed that they would like car-free neighbourhoods and city centres. Supporting this, 72% expressed that they would like the roads to be redesigned to give priority to pedestrians, cyclists, and public transport. Finally, 66% supported the replacement of combustion engines with electric vehicles within the next 20 years. These findings suggest strong support among citizens in Singapore for a car-lite and more sustainable transport system and the pursuit of cleaner mobility technologies, which complements with Singapore's mobility vision.

Sciforum-033507: Urban Mobility Planning, Environmental challenges, and Digitalization– key to Blue-Green Smart City & Mobility as a new concept with Using the i-Sustainability Plus and 5th Wave Theories (Case study: South Korea and Germany)

Prof. Dr. Hamid Doost Mohammadian

[1] Fachhochschule des Mittelstands (FHM), Bielefeld, Germany

Fundamentally, during humans' history inventions and innovations have been created through restrictions and challenges. Wars, sanctions, low sustainability, risks of contagion, recessions, climate pollution, environmental change, biodiversity collapse, urban sprawl and growing urbanizations are introduced as main restrictions. Wars and welfare integrate with human's life desirably or undesirably and make innovation.

Today we are in the twenty-first century and we have passed the 1st, 2nd, 3rd, and 4th waves (ages) and based on the 5th Wave Theory, we are entering to edge of tomorrow. Before 1970 various businesses and economics could affect and improve technologies, and humans' life. Since we reached the 70ies, and with the beginning of the 3rd wave or the post-industrial era, the new modern technologies such as Information Technology (IT), Internet of Things (IoT), Internet of Business (IoB), and innovative smartness in addition, issues such as know-how, do-how, Artificial Intelligence (AI), and others could influence businesses, the economy and even human life.

Generally, large cities such as capitals struggle with urbanization problems like environmental problems and climate change, mobility, infrastructure challenges, poverty, slum, economic problems, social instability, and health diseases that threaten humans' beings. Sustainability is not sufficient key for these cities to improve their quality of citizens' life. So, a new concept of urban life in needed. Digitalization, high technology, and ubiquitous concept could create novel concept concerned on urban setting named i-Sustainability Plus. Ubiquitous and smartness idea are combination of real life, high technology, and virtual reality. Fundamentally, ubiquitous smart city and mobility with sustainability is the best key for cities especially large city deal with urbanizations' problem to create new green and sustainable area for citizen with high quality of life and livability. In this research, U-city, smart sustainable mobility through i-Sustainability Plus theory will be probed as a new concept of urban living for Blue-Green smart city & mobility. In addition, challenges made some countries not to prefer to utilize ubiquitous idea as a tool for their problems, will be explored.

Sciforum-033560: Urban Regeneration a planning approach for Sustainable transport system

Reazul Ahsan

[1] Department of City and Metropolitan Planning, the University of Utah

Seoul is the world number 5th Megacity, well established as a global economic center. From 1950 to early 1990, with the flux of internal migration and high private car ownership and shortage of alternative public transport systems, urban congestion and high concentration PM_{10} increased, which was 15 percent of Seoul 's total fine dust weight and make the city a nightmare to live and survive. In 1996 the Seoul government took on the first urban transport regeneration project to overcome traffic congestion and mitigate urban air pollution. Seoul introduced the Median Bus Lanes, which separates the bus line from the general traffic. The first successful plan of the Smart Seoul City Plan that started in 2002 was the Bus Rapid Transit Program with a Median Bus Lanes program. About 80 percent of Seoul 's regular commuters use public transit, both subway and bus. The Median Bus Lane BRT option is used by 20.1 percent among them. Busses operated via Median Bus lanes used CNG as a clean fuel to mitigate pollution and operating technology in real-time. This research evaluates the median bus lane service as an urban regeneration project that introduces alternative public transportation and minimize air quality and congestion. In performing the research three different analytical methods were used. Those are urban design analysis to understand urban regeneration practice to design the median bus lane services. Public perception study, with semi-structured questionnaire to examine frequent commuters and consumers opining about this median bus lane operation. Third approach is the secondary literature survey to evaluate environmental and economic impact the median lane bus service.

Before this restoration initiative for urban transport started in 2002, the amount of PM_{10} in Seoul air was above 75 µg / m^3. It fell to 44µg / m^3 after 11 years, which is lower than Korea's average air quality (50µg / m^3) after introducing the median bus lane service. On the other hand, real-time operating technology minimizes the time needed for commuting. The separate and fastest bus lane, smart technology, and green fuel make this transport project an exemplary regeneration project which saves energy, time and ensures clean air for a fast-growing urban area. This paper discusses the urban regeneration of public transport, introducing median land along with smart technology is a better solution to reduce urban air pollution and congestion, using as an example, the Median Bus Lane project in Seoul.

Sciforum-033627: Smart mobility in the Mediterranean cities. A case study of the effects of externalities in cities

Ana Pego

[1] Nova University of Lisbon

Smart mobility is related to the capacity of creating transport efficiency in cities. Indeed, the increase in smart mobility within cities has had a positive impact on citizens, industry and the consumption of renewable energy. In Mediterranean cities, the capacity to create new projects related to smart mobility and their capacity to involve the ecosystem, in particular citizens, is part of urban planning in many countries. The adjustments made to urban mobility are the capacity to create new planning for citizens, industries and services. This study presents a comparison of intelligent mobility in Mediterranean cities to find a correlation between externalities and sustainable development. The results showed that the use of intelligent mobility has a positive impact on urban development and there has been remarkable progress in connecting citizens, especially in cities where smart mobility is the result of an investment to promote prosperity and sustainable development. The study is based on the latest projects in smart cities in the Mediterranean.

Sciforum-033640: Examination of the Auto Sector: Equity through mobility solutions.

Wendy Purcell

[1] Harvard T. H. Chan School of Public Health, Harvard University

A Robert Wood Johnson Foundation grant supports research between the Harvard Business School and the Harvard T. H. Chan School of Public Health to explore how business can adopt a 'Culture of Health' (COH) - namely health of consumers, employees, community and the environment. The study includes an examination of the Auto Sector – a global sector experiencing profound disruption, with both negative impacts on health and positive impacts on equity through mobility solutions.

To date, 65 in depth-interviews have been conducted with Auto industry leaders (35 C-suite, 24 Senior-level and 6 Management-level executives) from seven leading global Auto brands, representing the three largest automotive manufacturing regions of the world - GM, Ford and Tesla in the US, Toyota and Hyundai in Asia, and BMW and the Renault-Nissan-Mitsubishi Alliance in Europe; interviews with three other top companies are planned. The companies also include two of the top three largest auto manufacturers by global sales volume (Toyota and the Renault-Nissan-Mitsubishi Alliance) and Tesla, viewed by many as disruptive to the industry overall.

Using a five-step engagement methodology developed by the study, key themes relating directly to shaping the future of mobility have emerged:

1. All companies had a deep appreciation of the larger mobility landscape in which they operated, with several developing future mobility solutions for society overall, some focusED on underserved communities given those with the least socio-economic status in society rely heavily on mobility but have least access to effective mobility solutions;
2. Each company expressed a mix of optimism and pessimism about the future, and specifically how they would fare going forward moving from being a 'car company' to a 'mobility company';
3. Companies were adopting very different approaches on how to make bigger, bolder steps, given technological and societal changes disrupting the sector, as they developed enhanced mobility solutions;
4. Using the COH framing, and language that resonated with the Auto sector, was a way to explore changes across the different stakeholder dimensions, with equity as a shared lens.

Given the conditions of volatility, uncertainty, complexity and ambiguity in the Auto sector it is a suitable case study in which to examine how executive leaders are linking profits and purpose. Adopting a COH framework can support Auto sector leaders contextualize their benefits to society and support bold action to promote social good through improved mobility.

- [1]Paloma, M. (2018). Teaming up with Harvard to bring health to business.
- https://www.rwjf.org/en/blog/2018/05/teaming-up-with-harvard-to-bring-health-to-business.html (accessed 2/12/20)
- [2] Gao, P., Kaas, H-W., Mohr, D. and Wee, D. (2016).
- Disruptive trends that will transform the auto industry. McKinsey & Company, Advanced Industries in Automotive revolution - perspective towards 2030. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/disruptive-trends-that-will-transform-the-auto-industry (accessed 2/12/20)
- [3] Quelch, J. A. & Boudreau, E. C. (2016). Building a Culture of Health: A New Imperative for Business. Basel: Springer International Publishing AG.

Sciforum-033738: Mass Transport, Urban Governance, and Everyday Life: A Case Study of the Delhi Metro

Rashmi Sadana

[1] George Mason University

Delhi's new metro rail system is not only transport infrastructure, but also as a mode of governance, a vehicle for social mobility, and a driver of the city's urban plan. The Metro is both a method and an ethic, marking out a new way to urbanize and to be urban, to sustain the city and be sustained by it. Public transport and especially metro systems are powerful ways in which to analyze the relationship between citizens, the state, and urban space since these systems are at once capital-intensive mega-projects, disciplining institutions, and social levelers. In the case of Delhi, the Metro has transformed the urban landscape and built environment, creating new public spaces throughout the city. Since the first line opened in December 2002, the Delhi Metro has become part of the lived experience of the nearly three million who have come to ride it each day. Today there are nine lines and over 285 stations, covering nearly 400 kilometers of Delhi's National Capital Region, and extending into the neighboring states of Uttar Pradesh and Haryana. At the peripheral edges of the city where the Metro meets more rural sensibilities, ideas of the urban get created and contested. This research is based on a ten-year span of ethnographic fieldwork in Delhi, among Metro officials, urban planners, architects, and commuters. The aim of the research is to detail the Metro's key domains and contestations in order to showcase what is being developed in and through the Metro. The findings reveal the ways in which the Metro is both inclusive and exclusive; how it has changed people's itineraries and senses of self; and how it has created a more cohesive urban identity, especially for those who ride it.

Sciforum-033769: Proposed Framework for Assessing the Priority Location of New Medium and High Capacity Transport Stations

Elaine Vazquez[1], Beatriz Rodrigues[2], Mohammad K Najjar[3], Assed Haddad[4], Ahmed W A Hammad[5]

[1] Programa de Engenharia Urbana - UFRJ

[2] Departamento de Construção Civil Universidade Federal do Rio de Janeiro

[3] Centro Universitário Gama e Souza (UNIGAMA)

[4] Programa de Engenharia Ambiental - UFRJ

[5] Faculty of Built Environment of New South Wales University, Sydney, Australia

The inadequate supply of urban public transport in many of the major cities in Brazil encourages the use of individual transport as a reason to the long distances and time traveled, which could hinder the accessibility of the users to different probabilities whether for leisure, culture, social or economic pillars. A novel framework herein is proposed to assess the priority location for constructing new medium and high capacity public transport stations that take into consideration the interaction between the public transport network and urban land use. The proposed framework is exemplified using People Near Transit (PNT) and population density indicators, in a study of the neighborhoods of the city of Rio de Janeiro, as a major Brazilian city. The expected results to be obtained through the use of the proposed framework is to identify the neighborhoods in which the public power can intervene to improve the mobility of the users, facilitating the daily displacements using public transportation.

Sciforum-033801: Potential Impacts of Autonomous Vehicles (AVs) on Carbon-Free Commuting of Tertiary Students

Ali Soltani[1, 2], Dhawala Anand[1], Andrew Allan[1]

[1] University of South Australia

[2] Shiraz University

Objectives: To investigate the travel behavior of university students, and their attitudes towards Autonomous Vehicles (AVs) as a Carbon-Free mode of commuting

Background: Travel pattern is the main element for understanding and defining transport needs in transport studies. Self-driving vehicles are closer to be a reality, with potential benefits like increased road safety. Hence emphasis has focused on gauging public views of these AVs. To date, studies have centered on the general public as potential users of AVs, whereas this study surveyed 105 students on their views, particularly to travel pattern and factors influential to acceptance of AVs.

Methodology: By categorizing participants into two groups (Mawson Lakes campus and Magill campus students), they were asked to provide their travel data along with their socio-demographics. Google Forms, a survey instrument was prepared, and it was administrated through online. Data collection took nearly two months and the same was used for analysis in the SPSS software. University of South Australia, Adelaide, South Australia was considered as the study area.

Findings: The outcomes displayed a significant difference in opinions for acceptance and adoption of AVs based on the field of study of students. The information also showed variation in views due to different socio-demographic factors. This study will be supportive to establish an understanding as to what infrastructures, numerous transport planning policies and strategies are required to be ready for the introduction of AV technology.

Sciforum-033804: Prospects for alternative powertrains for road freight transport in Italy based on a probabilistic TCO model.

Damiana Chinese, Massimiliano Breda

[1] University of Udine

In addition to claiming many lives, the worldwide pandemic has caused an unprecedented reduction in global economic activity. This has resulted, in the short term, in a reduction in greenhouse gases and pollutant emissions. Surface transport, in particular, has been found out to be the CO2 emission source which most intensely responded to the forced confinement, but several drivers could lead towards an even higher rebound emission trajectory in the long term, depending on how governments are shaping economy support plans. This paper explores some of these drivers by introducing a probabilistic model of the cost of ownership of traditional and alternative commercial vehicles used for road freight transport, which are commonly regarded as low emission options readily available in vehicle replacement. In particular, BEV are considered as alternative to diesel light duty vehicles, while CNG and LNG are analyzed as alternative MDVs and HDVs, respectively. Scenarios have been defined in terms of fuel and energy prices, and annual kilometers travelled, and incentives needed to make alternative powertrains competitive with diesel have been calculated and weighted against CO2 savings. Expected lower AKT at times of crisis reduce CO2 emissions, but make alternative powertrains less competitive, making an uptake of low carbon technologies even more difficult.

Sciforum-033870: Decarbonization Scenarios for Reykjavik's passenger transport: The combined effects of behavioral changes and technological developments

Kevin Dillman, Michał Czepkiewicz, Jukka Heinonen, Reza Fazeli, Áróra Árnadottir, Brynhildur Davíðsdóttir

[1] University of Iceland

Transportation plays a defining role in daily life, and with this demand comes an increasingly large source of GHG emissions. Cities can act as macro-level systems in which the transportation sector and associated GHG emissions can be measured and governed within their boundaries. This study thus performed a scenario analysis using the Reykjavik capital area as a case study decomposing the combined effects of behavioural changes and technological developments, measuring both the impacts of direct and indirect emissions. Reykjavik provides a unique "real-world" case in which the electrical grid is already highly decarbonized, and thus the maximum effect of electrification can be seen. The inclusion of the oft unconsidered indirect emissions also gives a deeper understanding in how the size and composition of a car fleet impacts global GHG emissions outside of a region's boundaries and localized commitments. A business-as-usual case was developed using localized inputs and six additional "what-if" scenarios were developed using the story-and-simulation approach, modelling axis-based technological and behavioural/urban form changes. The results showed that in terms of total GHG emissions, changes to behaviour and urban form would lead to less GHG emissions then a purely technological development scenario due to the indirect emissions associated with the large amount of embedded indirect emissions associated with a large vehicle fleet with a high BEV composition. The technological scenario would lead to less direct emissions however due to electrification. The lowest GHG scenario would be an integrated approach in which both technological, behavioural/urban form changes are incorporated. This research highlighted the fact that even with an already decarbonized electrical grid, significant political and social efforts will need to be made to advance electrified technologies, urban behaviours, and city structures in order to reach deep levels of decarbonization that many cities wish to achieve.

Sciforum-033891: Corporate car sharing with incentive system for ecologically sustainable driving as an alternative for ecologically and ecologically sensible short and medium business trips

Benjamin Jacobsen

[1] Chemnitz University of Technology

Purpose

The employees of many companies and organizations regularly have to travel short and medium distances (a simple distance of less than 50 km). [1, 2] Accounting for these business trips usually requires a relatively large amount of bureaucracy. For this reason, internal Mobility-On-Demand solutions are occasionally offered that eliminate the billing procedure. In such a case, the means of transport used should enable mobility at the lowest possible cost. If the car is chosen as the best solution, its use should be as environ-mentally friendly and cost-effective as possible. Therefore, incentive systems for an eco-logically sustainable driving style are conceivable in order to positively influence the users. In the project ECoMobility of the Chemnitz University of Technology, the Chair of Management Accounting and Control worked on and answered these questions, among others.

Methodology

In order to evaluate the advantages of an internal mobility concept compared to a billing-based model, the data collected in the ECoMobility project were directly used. In the case of business trips, which are covered on the basis of a conventional accounting system, the costs consist of the personnel costs incurred for the accounting procedure and the actual travel costs. In an internal mobility concept, only costs for the provision of the mobility carriers are incurred. In addition, the influence of opportunity costs due to differences in travel duration when using different kinds of mobility was examined. To determine the economic benefit of incentives for ecologically sustainable driving, assuming that appropriate mobility solutions are offered, various incentive systems were examined. To prove and compare their effectiveness, the significance of the reduction in energy demand as a result of the incentive granted was first demonstrated. Subsequently, the incentives were ranked according to their effectiveness before a cost ceiling for incentives based on fleet mileage was determined. The economic assessment is based on the net present value method with subsequent examination of certain critical parameters. The method thus corresponds to that of life cycle costing. A comparison of the ecological effects was carried out only rudimentarily by showing the carbon dioxide emissions per kilometer.

Findings

The results clearly show that the provision of a mobility pool, which can be used for business trips, promises an economic advantage over the conventional accounting model with billing for individually selected modes of transport. If the opportunity costs for taking into account the slower travel by public transport and bicycle compared to the car are included, the latter has the lowest kilometer costs. The second place is taken by pedelecs and the third place by public transport. If the mobility costs are not taken into account, the pedelec and car change places. Public transport is always the most cost-intensive alternative due to the investigated ticket variant. The review of the effectiveness of the incentives for eco-logically sustainable driving has shown that each incentive design examined has led to a significant reduction in driving energy requirements. The savings achieved were over 5%. Depending on the basic consumption of the fleet, an incentive which would be

associated with costs of 100 € would thus be amortized after a fleet mileage of approx. 25,000 km.

Implications

The results of the study show that the generally costly accounting process for short and medium business trips cannot be justified economically. Even a separately maintained mobility concept would be more cost-effective for such routes. Within this concept, the advantages of the various mobility carriers are relatively close to each other, so that they may react very sensitively to endogenous and exogenous factors. For this reason, great importance should be attached to user acceptance and the highest possible level of sustainability when developing a corresponding concept. Furthermore, the granting of an incentive for ecologically more sustainable driving can be highly recommended. On the one hand, a fleet mileage of 25,000 km is quickly reached, and in addition, corresponding incentives have a long after-effect, which increases their effect. Furthermore, only energy costs were taken into account in the evaluation. It can be assumed that maintenance costs will also be reduced by lower wear, but no reliable data were available so far.

References

[1] BMUB, “Wirkung von E-Car Sharing Systemen auf Mobilität und Umwelt in urbanen Räumen (WiMo-bil): Gemeinsamer Abschlussbericht,” FuE-Programm "Förderung von Forschung und Entwicklung im Bereich der Elektromobilität" des, Bundesministerium für Umwelt, Naturschutz, Bau und Reaktor-sicherheit (BMUB), 2015.

[2] WiMobil, “Studie zu Carsharing in München und Berlin,” Carsharing News, 16 Oct., 2015. https://www.carsharing-news.de/studie-carsharing-muenchen-berlin/ (accessed: Jul. 29 2020).

Sciforum-033976: Beyond mobility: the practicality of 'working from home' as an alternative to daily commuting for the working women of Mumbai Metropolitan Region

Sujayita Bhattacharjee

[1] University of Mumbai

In India, the 'work from home' culture has been gaining popularity in recent times. Although it has been prevalent to a certain extent in some sectors of work, it came to be adopted extensively only after the outbreak of the COVID-19 pandemic and imposition of the measures of lockdown. This has provided people with the opportunity of working from the comforts of their homes without requiring them to commute to the places of their work. In the case of the Mumbai Metropolitan Region of India, where people usually commute for long duration to reach their places of work, the ability to work from home appears to have been saving a lot of time. However, working from home has its own disadvantages and it may not be a very practical approach. Hence, the study questions the practicality of 'working from home' as an alternative to daily commuting specifically in the case of the working women of the Mumbai Metropolitan Region. The study is based on a mixed methodology wherein both quantitative and qualitative data, collected from primary as well as secondary sources are used. The results of the study reveal the existing reality reinforcing the need for and importance of mobility in the lives of working women.

Sciforum-034019: The Future of Road Public Transit: Autonomous and Accepted?

Samuel Chng, Lynette Cheah

[1] Singapore University of Technology and Design

Autonomous road vehicles are currently being developed and trialed in many cities today. The introduction of autonomous road vehicles will likely change how we travel in the coming decades, including public transit. Autonomous electric vehicles such as buses and shuttles are being developed as potential replacements to conventional vehicles used in public transit that will make public transit a more accessible and sustainable alternative. In preparation for when the technology matures and is implemented on a wide scale in cities, it is important to understand how the general public perceives these developments and whether they are ready to accept them. Here findings from two studies, one quantitative and the other qualitative, on the perception and acceptance of the introduction of autonomous road public transport conducted in Singapore, a public transit-centric city, are presented. Both sets of findings found general acceptance among the local participants of plans to introduce autonomous road vehicles in public transit in the city. The hopes that autonomous road vehicles will improve accessibility and reliability in the public transit service underlies this acceptance. Nevertheless, concerns surround the lack of clarity about the legal liability when incidents occur and the potential for technical-related incidents was prevalent. In the initial stages of introducing autonomous road public transit, the assurance that the relevant governmental authority has thoroughly tested the vehicles prior to deployment and the continued involvement of human operators within the autonomous system were highlighted by participants to be critical for assuring them. Further implications of these findings on policy and research into autonomous road public transit will be discussed.

Sciforum-034024: Built Environment of Settlements and Carbon Emission of Household Travel: A Case Study in the Central Area of Nanjing City

Longbin Zhu, Hongyan Xiang

[1] Nanjing Tech University

After a rapid urbanization characterized by spatial expansion, the upgrading of old residential areas in the central areas of Chinese cities, especially those built before 1998, will be a focus of future urban construction, for such problems as in infrastructure, public service and transportation. In 2020 alone, it is planned to upgrade 39,000 old settlements and 7 million households nationwide in China. As household daily travel is one of the key sources of urban carbon emission, how to reduce the emission while improving transportation conditions during the upgrading is an urgent issue faced by planning professionals and decision makers. This paper examines the impact of built environment elements (e.g. density, diversity, design, destination accessibility and distance to transit) of old settlements on travel carbon emission in the central area of Nanjing City. Taking 9 typical settlements as example, this research builds a multiple linear regression model and analyzes, based on the data captured from the field surveys and the Internet, the relevance of the built environment elements to the household travel carbon emission. The result will serve as a basis for the professionals and decision makers to develop low carbon strategies in the upgrading of the old settlements.

Sciforum-034069: Influence on the air quality of Cuenca (Ecuador) due to the future shift from diesel to electric buses.

René Parra

[1] Universidad San Francisco de Quito

Most of the buses in Ecuador run on diesel, emitting considerable NOx and PM2.5, among other air pollutants. According to the last air emission inventory (base year 2014) from Cuenca (2500 masl), an Andean city from Ecuador, these vehicles emitted 1861.2 t/yr and 87.2 t/yr of NOx and PM2.5, representing 31.1% and 22.7% respectively, of the total emissions of each pollutant. Into the framework of promoting the use of low impact energy and efficiency, the Ecuadorian energy efficiency law requires by 2025 that all vehicles incorporated into the public transportation system must be electric. To assess the impact of this shift, we simulated the air quality during September of 2014, under two scenarios for the public transportation system: 1) buses running on diesel (DB), and 2) electric buses (EB). We used the Eulerian Weather Research and Forecasting with Chemistry (WRF-Chem) model. For the EB scenario, the combustion emissions from buses were eliminated. The difference between the two scenarios (BD-BE) showed decreases in the daily maximum hourly NO2 (between 0.8 to 16.4 µg/m3, median 7.1 µg/m3), and in the 24-hour mean PM2.5 (0.2 to 1.8 µg/m3, median 0.9 µg/m3) concentrations. However, the daily maximum 8-hour mean O3 increased (1.1 to 8.0 µg/m3, median 3.5 µg/m3). Apart from the primary air quality benefits due to decreases in NO2 mean and PM2.5 levels, owing to the VOC-limited regime for O3 production in this city, modeled results suggest that VOC controls should accompany future NOx reduction, to avoid increases in O3. Modeled tendencies of these pollutants are consistent with the behavior observed during the COVID-19 lockdown, which supports the validity of the approach used in this contribution to assess the effects of the future shift from diesel to electric buses in this city.

Sciforum-034091: Transportation and Sport Events: Understanding Consumers Carbon Offsetting and Sustainable Mobility Behaviors

Stavros Triantafyllidis

[1] The Citadel, Military College of South Carolina

Background

The need for measuring the carbon dioxide (CO_2) emissions generated by transportation practices in the sport industry has raised the attention of both practitioners and researchers (Trail & McCullough, 2019; Triantafyllidis & Kaplanidou, 2019). Also, sport organizations and events have made efforts to develop sustainability mechanisms that can assess the ecological impact of sport consumers (Barret et al., 2019; Casper et al., 2015). Recent studies have highlighted that the focus on environmental mechanisms should focus on the transportation of participants in the context of sport event consumption (Triantafyllidis, Kaplanidou, & Triantafyllidis, 2018). The transportation impacts of sport events consumers have been identified as severe because only in the United States and the major-scale and mass-participant sport events attract an average of 80,000 spectators (Triantafyllidis, 2018; Triantafyllidis et al., 2018). The most substantial impact on the environment during sport events comes from the CO_2 generated by spectators' traveling behaviors. A recent study found that most of the spectators travel more than 80 miles by using single-occupant vehicles (i.e., (Triantafyllidis et al., 2018). The traveling habits of spectators have shown that each individual generates 8 tons of CO_2 emissions every time they use their cars to attend a sport event Triantafyllidis et al., 2018). Therefore, the development of a mechanism that could control and reduce the generation of CO_2 can be a crucial tool for reducing CO_2 in collegiate football events (Triantafyllidis et al., 2018). However, there is still a lack of knowledge of how sport organizations can implement sustainable mobility plans to decrease the environmental impacts occur in sport events.

Theoretical Framework and Purpose of Study

Based on the Theory of Planned Behavior, there is evidence that people's pro-environmental behavioral intentions, can determine their pro-environmental behaviors that may undertake in the near future (Kollmuss & Agyeman, 2002; Walton & Jones, 2018). Also, studies have shown that gender has a crucial role in determining pro-environmental behaviors (e.g., Diamantopoulos et al., 2003). However, there is still a lack of knowledge about how people perceive the role of engaging in voluntary carbon offsetting practices and using sustainable mobility. The current study measured participants' voluntary carbon offsetting (VCO) behavioral intentions to understand their willingness to mitigate the carbon footprint from their sport event consumption, as well as their desire to use sustainable mobility in the future (SUSMOB) (Wicker, 2018). By understanding the willingness of spectators to offset their CO_2 emissions generated and their behavioral intentions to use sustainable mobility, this research could provide crucial insights for sustainable planning and policy development of mobility in sport events, that could also apply in the urban development of growing cities (Triantafyllidis, 2018).

Method, Data Analysis, and Results

Data collected from N = 929 sport event participants through a web-survey questionnaire. The 60.4% were females (n=561) and 39.4% were males (n=368). The 32.3% of participants were between 51-60 years old (n=299), the 12.7% stated that their annual household income was more than $100,000 per year (n=118), the 69.3% has a partner or were married (n=64), the 67.7% had at least a Bachelor's Degree (n=673), and the 77.5% were white (n=719). In addition, the 69% of the participants use their car to attend the sport event (n=641), the 21.2% carpooled (n=197), 4.1% travel with airplanes (n=38), 3.0% use buses (n=28, 1.8% walked or bike (n=17) and 1% indicated that they use other mode of transport (n=8). The descriptive statistics among all participants were for VCO behavioral intentions (M=6.25, SD=.58) and for their willingness to use a bike or walk in the near

future (SUSMOB) (*M*=6.12, *SD*=.65). For the data analysis, two independent t-tests used to explore the gender differences in the mean of VCO and SUSMOB behavioral intentions. Also, due to the high and significant positive correlation between VCO and SUSMOB behavioral intentions, there were conducted two separate Analysis of Variance (ANOVA) to check the difference in the means of (1) VCO and (2) SUSMOB across the conditions of the modes of transportation variable.

Results of the first t-test indicated that males (*M*=6.82, *SD*=.39) presented significantly higher behavioral intentions to VCO than females (*M*=5.88, *SD*=.33) with *t*(927) = 39.88, *p* .001. Similarly, the second t-test illustrated that males (*M*=6.70, *SD*=.46) presented significantly higher behavioral intentions to use SUSMOB in the near future compared to females (*M*=5.74, *SD*=.44) with *t*(927) = 31.94, *p* .01.

Moreover, the first one-way between participants' ANOVA was conducted to compare the mode of transportation used by sport event participants on VCO behavioral intentions for car, carpool, airplane, bus, walk or bike, and other modes of transport. The findings of the first ANOVA showed a significant effect of modes of transportation used by the sport event participants on their VCO behavioral intentions at the *p* .01 level for the six conditions *F*(5, 923) = 2.38, *p* .01. Also, the comparison of the means using Tuckey's Honestly Significant Difference procedure did not indicate any significant comparisons across the participants' modes of transportation.

Moreover, the second one-way between participants' ANOVA was conducted to compare the effect of mode of transportation on SUSMOB behavioral intentions. Results indicated that there was a significant effect of modes of transport used by the sport event participants on their VCO behavioral intentions at the *p* .001 level for the six conditions *F*(5, 923) = 9.91, *p* .001. Also, the comparison of the means using Tuckey's Honestly Significant Difference procedure indicated three significant comparisons:

First, participants who carpooled (*M* = 6.30) reported that their SUSMOB behavioral intentions were significantly more likely to occur (*p* .001) than participants who used their cars (*M* = 6.02).

Second, participants who used an airplane (*M* = 6.45) reported that their SUSMOB behavioral intentions were significantly more likely to occur (*p* .01) than participants who used their cars (*M* = 6.02).

Third, participants who biked or walked (*M* = 6.47) reported that their SUSMOB behavioral intentions were significantly more likely to occur (*p* .05) than participants who used their cars (*M* = 6.02).

Discussion

The findings of this study provide essential information regarding sport event consumers' gender, transportation practice based on the modes of transport, their VCO, and sustainable mobility behavioral intentions. However, the findings can be generalized in the development of growing and smart cities. Accordingly, this study highlighted the significant role of gender in sport event consumption and pro-environment behavior (e.g., Diamantopoulos et al., 2002; Kollmus & Agyeman, 2003). Specifically, this study highlighted the significantly higher likelihood of males to both VCO and use sustainable mobility in the near future compared to females. This contrasts with previous literature (e.gh, Diamantopoulos et al., 2003) that supports that women are more likely to engage in pro-environmental action than men. Additionally, findings shed light on VCO among sport event consumers. Accurately, all participants presented a high willingness to offset their ecological footprint when they travel to participate in sport events. This new information can be used for developing sustainable policies where consumers who overconsume products and services should compensate for the relevant greenhouse gas emissions generated from their consumption habits.

Furthermore, the findings can assist urban sustainable planning and development in cities and events where transportation is required due to the vast distances, the current infrastructure, and the lack of alternative transportation options. For example, cities can promote carpooling practices by developing infrastructure where people can carpool at a specific radius in the cities. Also, government officials can encourage walking and bicycling by developing pedestrian and bike lanes across the streets and highways.

Sciforum-034143: Design and analysis of sustainable photovoltaic based Peripatetic charging infrastructure

Kameswara Prakash[1], Chockalingam Aravind Vaithilingam[1], Gowthamraj Rajendran[1], Agileswari Ramasamy[2]

[1] Taylor's University

[2] Universiti Tenaga Nasional

United Nations Development Programme has proposed seventeen sustainable development goals for global goals to ensure that the people enjoy peace and prosperity by the end of 2030. Electric vehicles are one of the sustainable modes of transport available to meet the goal of climate action, affordable and clean energy of sustainable development goals. Globally 2.1 million electric vehicles have sold out in 2019 and contributing to 2.6% of global car sales. Due to its global rise, the increase in fossil-fueled conventional charging stations leads to higher levels of greenhouse gas emissions which derails the primary purpose of sustainable development goals. Thus, the need for sustainable charging stations are in huge demand. Solar charging stations with intermittent energy storage can act as level 2 DC fast charging station to charge electric vehicles. In this paper, novel onsite solar-powered peripatetic charging station with intermittent energy storage is proposed, designed and analyzed. The intermittent energy storage needs to get charged as quickly as possible from solar power to act as level 2 DC fast charging station. For this process, the concept of pulse-based charging is introduced along with maximum power transfer algorithm. The pulse charging intended for charging intermittent storage unit with less time and considerably less rise in temperature. The test system is simulated and analyzed using a numerical tool. The results were proved that solar-powered pulse-based charging stations are efficient for its peripatetic and sustainable nature.

Sciforum-034146: Design and Development of Charging Stations Based on VOC – VR for Sustainable Electric Mobility

Gowthamraj Rajendran[1], Chockalingam Aravind Vaithilingam[1], Kameswara Satya Prakash[1], Kanendra Naidu[2]

[1] Taylor's University, Selangor, Malaysia

[2] Universiti Kuala Lumpur British Malaysian Institute

Sustainable mobility is a key challenge to mitigate global climate change. Electric vehicles are an effective means of transportation, which are environmentally friendly. The increase in the number of electric vehicles on the road has raised the need for electric vehicle charging stations. This article aims to implement charging stations for electric vehicles. The Vienna rectifier is used as an AC / DC converter for charging stations for electric vehicles. In recent years, Vienna rectifiers have gained prominence for converting ac to dc. The converter has the following benefits: low total harmonic distortion (THD), high power density, and high performance at input current. This paper introduces voltage-oriented control with PI control strategy based on the transformation of stationary coordinates α-β and synchronous rotating coordinates d-q axis. This control technique aims to control the d-axis and q-axis portion of the grid side current as well as to maintain the dc bus voltage at the desired level in the output with a unity power factor on the grid side. Due to this control strategy's inherent current control loop, high static performance and fast transient response can be ensured. In addition, this analysis is carried out using numerical modelling to simulate voltage-oriented controller with Vienna rectifier (VOC-VR). The simulation results show that the input current THD of the proposed VOC-VR system is 3.27%, lower than 5% to meet IEEE-519. The output voltage and current measurements are 650V and 90A. The proposed system can be implemented for high power applications such as DC fast-charging stations and welding power sources with this performance parameter.

Sciforum-034405: The impact of the COVID-19 emergency on local vehicular traffic and its consequences on the environment: the case of the city of Reggio-Emilia (Italy)

Samuele Marinello

[1] EN&TECH

The health emergency due to the rapid and uncontrolled spread of COVID-19 has imposed the need to resort to immediate and urgent actions for its containment. In particular, on March 11th 2020 World Health organization (WHO) has proclaimed this emergency as a pandemic, encouraging world governments to adopt drastic solutions. The decision to limit and/or stop non-essential economic and commercial activities, to limit the movement of people and to declare a state of health emergency was the most common procedure at international level. Despite the tremendous financial repercussions for global economies, the interruption of industrial activities and the movement of vehicles has favored a general improvement in environmental quality, as widely described in the literature. Air quality also had significant positive consequences, with the reduction of emissions of polluting substances into the atmosphere and their consequent reduction in concentration values (in particular NO_2, SO_2 and CO).

The objective of this work is to report the assessment of the change in vehicle flows and in air quality of a specific study area, comparing the period February-May 2020 and February-May 2019. Circulating vehicles were measured at some characteristic points of the local road network (nine main access points to the city), while atmospheric pollutant concentrations were analyzed using data measured by the regional air quality monitoring network. The case study described is represented by the city of Reggio-Emilia (northern Italy), included within the PO valley which has notoriously important air pollutant concentrations and which has been severely affected by the emergency COVID-19.

The results of the study highlight a rapid decline of the vehicles circulating in 2020 by about 40% and, considering the Italian lockdown period (10th March-18th May 2020), the reduction observed is approximately 64%. Similarly, the polluting concentrations of NO_2, Benzene and CO decreased, while those of atmospheric particulate measured at stations classified as "urban traffic" increased.

Sciforum-034157: Lessons learnt from Singapore towards an efficient public transport policy: A case demonstration for the city of Puducherry.

Lakshmi Thilagam Natarajan

[1] Professor, Kalasalingam School of Architecture, Kalasalingam Acadeny of Research and Education, Krishnankoil, Tamil Nadu 626126, iNDIA

The dependence on automobiles in general and private vehicles in particular has become the norm of the day for commuters in Indian cities. The Indian auto industry is one of the fastest growing sectors with 29.08 million vehicles produced in 2018.On an average 24 million vehicles are added every year. The auto industry is one of the major contributors towards the degradation of the urban environment. Noise pollution, air pollution, discarding of auto wastes and chocked streets have all been on the increase in the last 2 decades. In spite of these increasing numbers the mobility prospects of the daily commuter have not seen any phenomenal improvement. Overcrowding at bus stops, long ques in metros and increasing monthly expenditure towards travel is a major concern of the large middle-class population of India.

This study explores some of the lessons learnt by this author on a recent visit to Singapore. Even as a tourist with no local support, this author effortlessly traveled by public transport during the trip and was able to witness first-hand the efficiency of mass public transport, ease of inter-modal shift and the seamless connectivity of multi-vehicle networking from Origin to destination for all the zones of the city.

Many of these lessons are applicable to Indian cities and can bring about lasting green solutions in the Indian transport sector. This study utilizes the case example of the city of Puducherry to demonstrate this possibility. The city of Puducherry was a quaint town 2 decades ago referred to as the “cycle city of India”. In a span of twenty years the city is facing acute problems in traffic and transport. And similar to Singapore the city of Puducherry is also a major tourist destination. Hence Puducherry is an appropriate town for the proposal of a green public transport policy.

Sciforum-034251: Transport sustainability in a pandemic

Zhanna Mingaleva

[1] Perm National Research Polytechnic University

The aim of the study is to analyze the changes that have occurred in the transport sector under the influence of COVID-19 and determine the directions for transport development. Transport is a special sector of the economy that has a dual impact on public welfare and development. On the one hand, transport provides transportation of people and goods, facilitates mobility, and contacts, creates a large number of jobs and provides a significant share of personal income and social benefits. On the other hand, transport, along with industry, is the most powerful source of environmental pollution, especially in large cities. It is a source of noise and harmful emissions that damage the health of millions of people around the world. COVID-19 significantly changed the functioning of the transport sector and its internal structure. During the time of quarantine and isolation, a new understanding of the place and role of transport in modern society has been formed. Several countries and regions have initiated transport reforms. The study is devoted to the analysis of economic and structural changes in the transport sector, an assessment of the prospects for its development in new conditions, the possibilities of reforming in the context of achieving sustainable development goals and improving environmental safety. To achieve the goal of the analysis standard research methods were used, including methods of theoretical modeling and institutional analysis, methods of economic and mathematical modeling, scenario analysis and forecasting methods. The results of the study will be used to create a comprehensive model for transforming the transport structure of national economies and regions, taking into account international trends and forecasts of pandemic development.

Sciforum-034260: Knowledge of the Sustainable Development Goals (SDG) in the recovery of domestic tourism in Mexico.

Daniela Palmas, Omar Ismael Ramírez, Rocío del Carmen Serrano- Baqruín

[1] Universidad Autónoma del Estado de México

From a resilient perspective, tourism is an activity that by its nature promotes the mobility of large volumes of people, therefore, it must induce people to work ethically and with values, in addition to coinciding with the SDG. In context, tourism has become one of the main economic activities in Mexico, because according to 2019 data the number of domestic tourists amounted to more than 100 million. However, this figure has been reduced due to the pandemic caused by COVID-19; This shows a crucial point to establish planning not only governed by economic interests but in which the benefit of all the actors is involved in the most harmonic way possible. In this way, the objective of this document is to identify tourists' knowledge about the SDGs and how they relate them to tourism activity during and after the pandemic. The research was exploratory in scope carried out through a virtual platform to answer a questionnaire under the snowball method to domestic tourists from Mexico. The results show that tourists will use their own car as a means of transportation, traveling with their family to crowded places with sun and sand; However, when talking about sustainable mobility, more than 50% of the 1,155-national answered that they do not know the SDG. What is worrying is that more than 67% do not apply in the activities they carry out during this mobility but consider that after the COVID19 Pandemic they are more responsible and responsible with natural and cultural resources. Likewise, 98% of national tourists, who are mobile during these times, would like to know more about how they can contribute to fulfill these SDG and leave a better planet for this and for future generations. Therefore, it is possible to conclude that the political, public, social, and academic sectors should work for hand in hand looking for concrete actions that allow society, in general, to know the SDG so that post-COVID-19 activity tourism minimizes negative the impacts of tourism in the natural and socio-cultural field.

Sciforum-034264: Shared Mobility in Cities After COVID-19: Changes in Offer and Demand in Europe

María del Mar Alonso-Almeida

[1] Autonomous University of Madrid; Faculty of Economics and Business Administration

Shared mobility has been growing during the last five years as a solution to facilitate mobility, especially in bigger cities. On the one hand, shared mobility widens the possibilities of mobility in big cities, both in timing and location. On the other hand, shared mobility helps to reduce pollution and, therefore, to improve the quality of air and citizens' health. Nevertheless, the COVID-19 disease and the worldwide lockdown have brought a change in the "share" concept, moving from "sustainability best option" to "coronavirus-spread best option". In fear of being infected, people choose to use their own car as the first option for city transport. Public transportation use has suffered a dramatic drop during the past months and this trend is not changing. Shared mobility stopped completely during the lockdown – from March to June. Now, with stronger sanitary and hygienic measures, shared mobility has restarted its operations. Some of these measures are based on protocols of Security and Prevention, such as regular disinfection of the fleet, cleaning vehicles with ozone-generating machines that eliminate toxins, bacteria and viruses in each application, and using polyethylene gloves and single-dose hydro-alcoholic gel inside the cars or motorcycles. Besides, other type of measures has also been taken to push the reactivation of shared mobility services through promotions and long-term rentals. This study aims at analyzing the "new normal" in shared mobility conducting in-depth interviews with the main companies operating in Spain. Implications for management, policy and research are presented, stressing the changes produced in consumer behavior and the impacts on environment and health.

Sciforum-034270: Towards inclusive urban accessibility: framework and methodology for urban transport inclusiveness assessment

Zhaowen Liu

[1] Delft University of Technology

Transport infrastructure is crucial in facilitating the development of cities and shapes the urban landscape, which in turn has implications on resource supply, environmental impact, and social network connection in cities. People rely on their cars, bicycles, or the public transport such as trains, metros, buses to get to work, to meet friends and to buy necessities. However, the current transport systems have not adapted to the actual needs of all dweller, especially for some vulnerable groups, such as the old, the disabled, women and the low-income people. Those people have been facing difficulties when using transport facilities, which can further affect residents' income, security, health, and social relations and eventually develop social inequality.

Among the 17 SDGs, Goal 11 specifically seeks to 'make cities and human settlements inclusive, safe, resilient and sustainable', in which highlight the target of providing access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. To achieve this goal, the first step is to develop an integrated approach for delineating, evaluating, and guiding the development of urban transport systems towards inclusiveness. In this research, we will firstly conceptualize an inclusive transport framework based on the inclusive city theories to identify in what aspects transport is influencing social inclusion in cities. Second, we will explore the principles, standards and indicators of urban transport inclusiveness and build the assessment model. Third, the indicators will be refined based on the specific local context and the transport inclusiveness assessment model will be applied to a case study in China. Guided by the spatial distribution and temporal changes of transport inclusiveness indices, the key factors affecting urban transport inclusiveness will be identified. Based on which, policy recommendations will be provided for subsequent planning and management of transport facilities.

Sciforum-034323: Mobility and accessibility to healthy food in the Global South: Assessing the role of open street markets in Chile

Juan Antonio Carrasco[1], Beatriz Cid[1], Gislaine Granfeldt[1], Carolina Leal[1], Carolina Rojas[2]

[1] Universidad de Concepción

[2] P. Universidad Católica de Chile

Despite important policy efforts in recent years, Chile has the highest obesity rate in America according to the World Health Organization due to sedentary behavior as well as poor healthy food patterns. Among the factors related to people's food consumption patterns and obesity, public health and related research fields remark the importance of people's urban environment and land use. Previous research has analyzed urban inequalities due to "food deserts" or poor urban areas where residents cannot buy affordable, healthy food. However, these analyses have focused mostly on the Global North and focus on corporative practices. In this context, the objective of this paper is to analyze mobility and accessibility to healthy food in a representative metropolitan area Chile (Concepción), with a special focus on the role of open street markets. The study is divided into two parts. First, mobility patterns are contrasted with an inventory of open street markets, supermarkets, and local convenience stores to analyze the accessibility levels of different socioeconomic groups to healthy food, using spatial analysis tools. Second, a Nutrition Environment Survey (NEMS), adapted to the Chilean context, serves to analyze the differences in the accessibility to different food groups among different territories, considering the existing socio-spatial segregation levels in the city. The results test the "food desert" hypothesis in the Chilean context, remarking the relevance of open street markets on providing good accessibility to fruits and vegetables, and the low levels of access to other necessary food groups for healthy nutrition. The study enumerates spatial and mobility inequities on the accessibility to healthy food, identifying policy opportunities for generating a sustainable and healthy food urban environment, and the role of popular urban economy and local food networks.

Sciforum-034337: Analysis of the intention of teleworking considering risk perceptions of commuting and ICT use

Naoki Takayama[1], Hitomi Sato[2], Meilan Jiang[2], Takayuki Morikawa[3]

[1] Institution of engineering, NAGOYA University

[2] Institutes of Innovation for Future Society, NAGOYA University,

[3] Institutes of Innovation for Future Society, NAGOYA University

Traffic congestion is one of the serious issues to solve for sustainable development. Many kinds of countermeasures, such as flexible-time work, public transportation improvement, and teleworking, have been investigated and implemented in many cities. Especially, the teleworking became popular all over the world with the spreading of the coronavirus pandemic. This special experience is expected to change our working styles into less commuting travel with more ICT use. This study focuses on the teleworking intention towards sustainable transportation system planning with and after coronavirus pandemic. In order to understand how the people percept risk of commuting and that of teleworking as well as to investigate the intention of choosing to teleworking under the risky situations, we conducted a web-based questionnaire survey at the end of March 2020. It was one week before the declaration of a state of emergency in Japan exactly when the people started to feel the risk of the pandemic seriously. The survey data was collected from 3,500 respondents who work and live in the three biggest metropolitan areas of Japan. 908 respondents out of 3500 answered that they have experienced teleworking while half of them have chosen to telework due to the risk of the pandemic. The ordered response probit model is utilized to estimate the teleworking intention. The result shows that people in their twenties and thirties, people with long commuting time, train commuters, those working in Tokyo metropolitan area which is the most highly dependent on the public transportation system in Japan, and workers of the information and communication industry are more likely to increase teleworking. On the other hand, the people who highly estimate the risks of teleworking, such as network errors, showed higher intention to reduce teleworking.

Sciforum-034365: Micro-mobility and mobility sharing: A shift towards a clear and sustainable urban future.

Puja Banerjee

[1] Research Scholar, Department of Geography, University of Mumbai, India

The rise of micro-mobility has reshaped the urban transport sector, leading towards a sustainable urban future. The innovations and developments in the very light vehicles category, like e-scooters, bicycles, or electric-assisted bicycles, with intention of carrying a single person for short trips became the part of smart mobility infrastructural development of the city. It has helped in dealing with pollution level, gridlock streets and lowering the environmental footprint along with being cost-effective and time efficient. In India, after the success of car-based shared mobility options such as Ola and Uber, shared micro-mobility is gaining importance in the Smart City Mission Scheme launched by the Government of India. The aim of the study is to critically evaluate the present status of micro-mobility through ridership status of tier 1 and tier 2 cities. The study will use ridership data of Delhi (tier 1) and Bhopal (tier 2) to analyze the growing inclination of citizen toward a clear and sustainable future. Besides, the ridership trend will further used to bring forth the backlogs that are hindering its development and adaptation under the Indian scenario. So, cumulatively the study will focus on the growing micro-mobility and mobility sharing outlook of the country and also focusing on the post-COVID-19 situations for gaining a clear and sustainable urban future.

Sciforum-034399: Sustainable Development Plan of Transport and Mobility in the City of Skopje

Assoc. Prof. Dr. Viktorija Mangaroska[1], Prof. Dr. Kosta Mangaroski[2]

[1] Faculty of Engineering- Architecture, International Balkan University, N. Macedonia

[2] Faculty of Architecture, SS Cyril and Methodius University, N. Macedonia

Abstract

Urban centers are drivers of global warming because they concentrate transportation, industries, households, and many of the emitters of greenhouse gases (GHG). Cities are at the center of the climate change challenge. The impact of urbanization on climate is likely to increase given future urban population and economic growth trends. With more than half of the world's population living in urban areas and an increased percentage in the future, urban areas make up the greatest concentration of climate vulnerable people and infrastructure. Sustainable development Goals by 2030, are also focusing on Sustainable cities and communities, in particular creating safe, affordable, accessible and sustainable transport systems.

The methodology approach in this scientific paper focuses on defining the measures for sustainable development transportation, sustainable urban mobility plan in Skopje, analysis of development of plan for improvement of bike lanes in Skopje, boulevard relocation for cycling, sustainable development of the public transport, road space relocation of public transport, electro-mobility, as well as, overcoming urban capacity challenges and creating urban adaptation planning that will be factor for sustainable development in the City of Skopje. The expected outcome results in this scientific paper is creating sustainable transport, urban adaptation planning that will contribute on the complexity of the city of Skopje: transport, energy supply, buildings, energy demand, low-carbon technologies.

Effective adaptation and mitigation planning demand clear metrics of success, a protocol to identify and construct policy levers, and tools for enhancing social and ecological capacities. Conceptualizing urban areas as sets of intersecting systems provides the basis to study the structure and organization of urban systems.

Sciforum-034402: How do public service obligations affect transportation for less developed regions of the European Union: The case of scheduled air services between Badajoz and Barcelona.

Antonio Martínez Raya, Víctor M. González-Sánchez

[1] UNED—National University of Distance Education

Transport connectivity plays a vital role in achieving greater territorial cohesion, in addition to combating rural depopulation. The maintenance of public transportation in peripheral areas can also lead to an improvement in the standard of living for citizens, particularly those living in a less developed region of the European Union (EU), such in the Spanish Autonomous Community of Extremadura. The city of Badajoz, despite being the most populated city in the region, has traditionally suffered from a lack of adequate interregional transport services. The aim of this research is precisely to analyze how the imposition of a Public Service Obligation (PSO) on scheduled air services linking Badajoz to Barcelona can enhance the efficiency and sustainability of the domestic transport system. To this end, all means of public transport (bus, train, and airplane) between both cities were examined in order to determine the effect of the public intervention (economic compensation from a PSO contract or a public contract for advertising services) on the European single aviation market. The findings of this study suggest that the PSO schema has been extremely useful in ensuring these passenger air services. It has led to a steady increase in the number of passengers carried, but without a significant change in demand on alternative transportation.


MDPI