14TH EUROPEAN IFSA SYMPOSIUM

FARMING SYSTEMS FACING CLIMATE CHANGE

AND RESOURCE CHALLENGES

10 – 14 APRIL, 2022, UNIVERSITY OF ÉVORA, PORTUGAL

PROGRAMME AND BOOK OF ABSTRACTS

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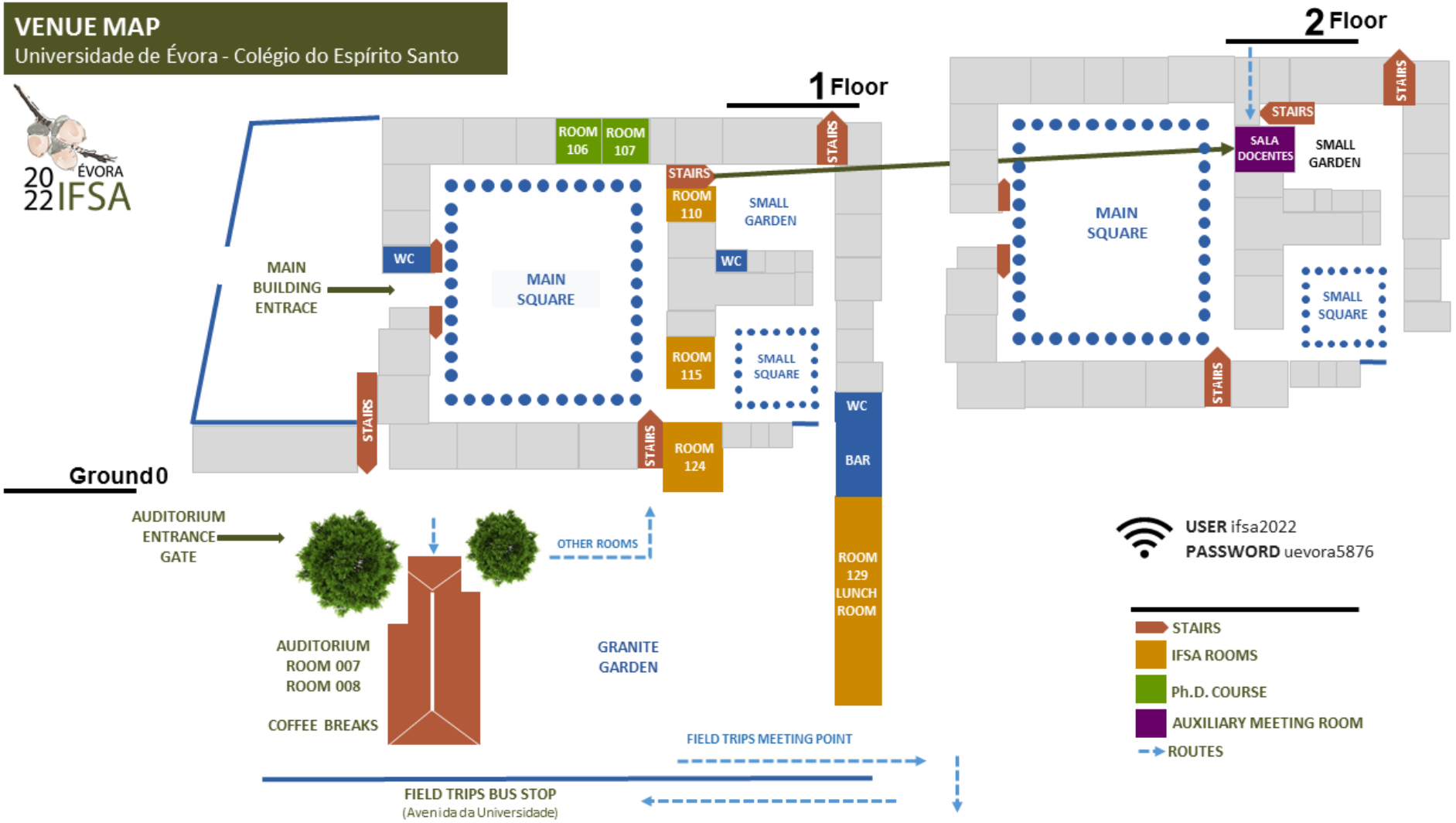
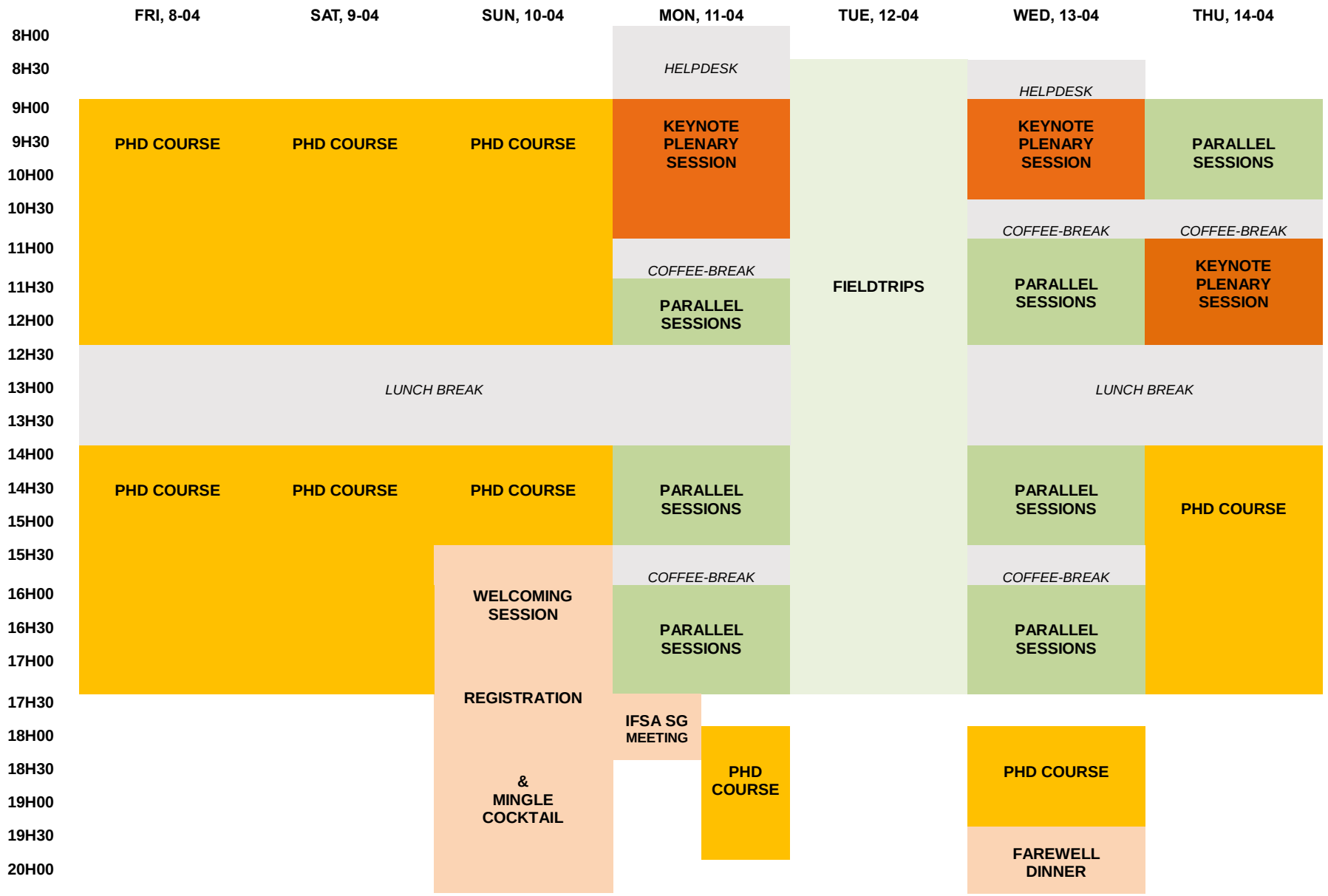
Universidade de Évora - Colégio do Espírito Santo



IFSA22 | PROGRAMME OVERVIEW



FULL PROGRAMME

FRIDAY 8 – SUNDAY 10

9.00 -17.30	PHD COURSE. *Room 107*

SUNDAY 10

15.30 – 20.00	REGISTRATION. *Auditorium's entrance*
17.00 – 18.00	WELCOMING SESSION. *Granite Garden*
18.00 – 20.00	MINGLE COCKTAIL. *Granite Garden*

MONDAY 11

08.00 – 09.00	HELPDESK AND REGISTRATION. *Auditorium's entrance*
09.00 – 10.45	PLENARY. *Auditorium* OPENING REMARKS **KEYNOTE I – HELENA FREITAS (PT)** AGRICULTURE AND TERRITORIAL COHESION IN PORTUGAL: AN ECOLOGICAL AND POLITICAL PERSPECTIVE **KEYNOTE II – SÉRGIO SCHNEIDER (BR)** THE CONTRIBUTION OF FAMILY FARMING TO FOSTER SUSTAINABLE FOOD SYSTEMS
10.45 – 11.30	Coffee break. *Exhibition Room*
11.30 – 12.30	**SESSION 1.1.** Enhancing innovation subsystems. *Room 007* **SESSION 1.2.** WORKSHOP | Stimulating interactive innovation in agriculture: how far did we come? And how do we continue? *Room 008* **SESSION 4.2.** Rural Development from a territorial perspective. *Room 115* **SESSION 5.1.** WORKSHOP | Sustainable digitalisation for rural areas: how to make ecological and digital transition converge? *Room 124*
12.30 – 14.00	Lunch Break. *Room 129*

14.00 – 15.30	SESSION 1.3. A better understanding of advisory services in farmers' decision making – results from the AGRILINK project. *Room 007* SESSION 1.4. Intermediation & evaluation in innovation support systems. *Room 124* SESSION 2.1. Participatory approaches for the science-practice interface. *Room 110* SESSION 3.1. Livestock management and other dynamics in agroecological systems. *Room 115*
15.30 – 16.00	Coffee break. *Exhibition Room*
16.00 – 17.30	SESSION 1.5. Innovation, governance & networks in innovation support systems. *Room 115* SESSION 2.2. Analytical approaches at the science-practice interface. *Room 110* SESSION 3.2. BOOK PRESENTATION | Governance for Mediterranean Silvopastoral Systems: Lessons from the Iberian Dehesas and Montados. *Room 124*
17.30 – 18.30	IFSA STEERING GROUP MEETING. *Room 110* AD HOC MEETINGS. *Available rooms: 007, 008, and 115*
18.00 – 19.30	PHD COURSE. *Room 107*

TUESDAY 12

08.30 – 17.30	FIELDTRIP A | WINE PRODUCTION FIELDTRIP B | LIVESTOCK FARMING SYSTEM FIELDTRIP C | MONTADO *Meeting point: Bus Stop at Avenida da Universidade*

WEDNESDAY 13

08.30 – 09.00	HELPDESK AND REGISTRATION. *Auditorium's entrance*
09.00 – 10.30	PLENARY. *Auditorium* KEYNOTE III - JØRGEN PRIMDAHL (DK) COLLABORATIVE STRATEGY MAKING FOR AGRARIAN LANDSCAPES
10.30 – 11.00	Coffee break. *Exhibition Room*
11.00 – 12.30	SESSION 1.6. Institutions & organisations in interactive innovation. *Room 007* SESSION 2.3. New perspectives at the science-practice interface. *Room 115* SESSION 4.3. The way forward for a holistic vision of food security. *Room 110* SESSION 6.1. Land systems dynamics in the Mediterranean basin – drivers and future perspectives. *Room 124* SESSION 4.1. WORKSHOP | Challenges faced by large European projects dealing with agriculture and food systems: evidence from the H2020 SALSA project. *Sala de Docentes*
12.30 – 14.00	Lunch Break. *Room 129*
14.00 – 15.30	SESSION 1.7. Interactive innovation in agriculture, forestry and rural development: learning from practioners to improve practice – some lessons from the LIAISON project. *Room 124* SESSION 1.8. Strategic planning and assessments of agricultural knowledge and innovation systems: defining a comprehensive analytical framework. *Room 007* SESSION 3.3. Agroecology in practice and resilience building. *Room 115* SESSION 6.2. Stakeholder involvement, land planning and governance across scales. *Room 110*
15.30 – 16.00	Coffee break. *Exhibition Room*
16.00 – 17.30	SESSION 1.9. Education, training & research in innovation support systems. *Room 007* SESSION 4.4. Supporting networks and their implication on sustainable food systems. *Room 008* SESSION 5.2. Assessing the future of smart farming. *Room 110* SESSION 6.3. Agricultural landscapes, agroecology and patterns of biodiversity. *Room 115* SESSION 2.4. WORKSHOP | Famer-led research and innovation: understanding the processes at the farmer and scientist interface? *Room 124*
18.00 – 19.00	PHD COURSE. *Room 107*
19.30 – 00.00	FAREWELL DINNER. *Sabores do Alentejo at M'AR de AR Muralhas Hotel, Évora.*

THURSDAY 14

09.00 – 10.30	**SESSION 1.10.** Extension methods in innovation support systems. *Room 007* **SESSION 3.4.** Determinants, factors and challenges in applying agroecology. *Room 115* **SESSION 4.5.** Small is beautiful: structural changes in food production and value chains. *Room 110* **SESSION 5.3.** Smart technologies in farming and food systems. *Room 124*
10.30 – 11.00	Coffee break. *Exhibition Room*
11.00 – 12.30	PLENARY. *Auditorium* **KEYNOTE IV – IKA DARNHOFER (AT)** CHALLENGES FOR FARMING SYSTEMS RESEARCH: LEARNING FROM EXPERIENCE AND LOOKING AHEAD CLOSING REMARKS
12.30 – 14.00	Lunch Break. *Room 129*
14.00 – 17.00	PHD COURSE. *Room 107*

THEME 1 – INNOVATION SUPPORT SERVICES

Innovation Support Services / ISS (found in the literature under different labels such as extension and advisory services, intermediary organisations, etc.), conceived as an integral part of Agricultural (Knowledge and) Innovation Systems (AKIS/ AIS), face theoretical and practical challenges. Such challenges relate to our current understanding that, on the one hand, innovation involves the successful combination of 'hardware', 'software' and 'orgware' and, on the other hand, that successful innovations are usually based on an integration of ideas and insights from multiple stakeholders engaged in networks. The latter implies that innovation processes are dependent on dynamics in networks; they are affected by complex inter-dependencies, unintended and unforeseen developments and interactions and may well be conflictive. Therefore, there is a sustained interest in inventing new ways to build innovations and the need for more robust theories, methodologies and tools.

The necessity to deal with interactions between heterogeneous and interdependent stakeholders who do not necessarily share objectives, knowledge, values or practices implies that the role of newly recognized actors (who have variously been called innovation brokers, intermediaries and free actors), stimulating the mutual learning process, is crucial. In such constellations ISS intermediaries (advisors) still play an important role, but different from what usually was assumed before. This implies a change of paradigm (i.e. the shift from transfer to 'intermediation') and new roles of advisors as facilitators / brokers, stimulating and facilitating the process of learning with stakeholders in networks (networking, linking, conflict management, vision building, etc.). In this respect, they need to properly utilise participatory and collaborative methodologies for the co-generation, adaptation, and use of innovations at scale.

S1.1 – MONDAY 11, 11.30–12.30. *Room 007*

ENHANCING INNOVATION SUBSYSTEMS

Chair: Andrea Knierim

Syndhia Mathé. New challenges for innovation support services to improve cocoa quality in Cameroon.

Tim Ndah. Regional and sub-system specialisation of innovation support services provided in Madagascar: what kind of impact can be expected for farmers?

Sarah Crestin-Billet. Supporting agricultural and agri-food innovations for staple food production in Cameroon: pluralism of organisations, duplication and discontinuity of services.

S1.2 – MONDAY 11, 11.30–12.30. *Room 008*

WORKSHOP | STIMULATING INTERACTIVE INNOVATION IN AGRICULTURE: HOW FAR DID WE COME? AND HOW DO WE CONTINUE?

Chair: Eelke Wielinga and Patrizia Proietti

S1.3 – MONDAY 11, 14.00–15.30. *Room 007*

BETTER UNDERSTANDING THE ROLE OF ADVICE IN FARMERS' DECISION MAKING – RESULTS FROM THE AGRILINK PROJECT

Chair: Pierre Labarthe

Eleni Zarokosta. Innovating amidst a weak and fragmented AKIS: exploring three Greek cases.

Leanne Townsend. The role of advisory services in the uptake of smart farming technologies: evidence from three countries.

Livia Madureira. Advisory support on non-technological innovations on farms: the case of direct marketing.

Eleni Zarokosta. Enabling environmental innovations on farms: what is the role of farm advisors?

Boelie Elzen and Jaroslav Pražan. Improving farming advisory services to stimulate development of sustainable agriculture.

S1.4 – MONDAY 11, 14.00-15.30. *Room 008*

INTERMEDIATION & EVALUATION IN INNOVATION SUPPORT SYSTEMS

Chair: Syndhia Mathé and Tim Ndah

Adewale Adenuga. Determinants of farmers' decisions to join a participatory extension programme: a mixed method analysis of Northern Ireland business development groups.

Lisa Blix Germundsson. Enabling farmers' continuous learning through social learning practices – the role of innovation support services.

Alexandra Smyrniotopoulou. Transdisciplinarity in agro-ecological research: an evaluation framework.

S1.5 – MONDAY 11, 16.00–17.30. *Room 115*

INNOVATION, GOVERNANCE & NETWORKS IN INNOVATION SUPPORT SYSTEMS

Chair: Eelke Wielinga

Anita Beblek. A business model for innovation support services.

Robert Home. Strategic funding of communities of practice to achieve policy goals: the examples of multi-actor innovation projects in the forestry sector in Europe.

Lisa van Dijk. Farmer-led innovation network, an emerging community of practice in the UK.

Eulalie Ramat. Links between the advisory system built by dairy farmers and their representations of the agroecological management of animal health.

S1.6 – WEDNESDAY 13, 11.00–12.30. *Room 007*

INSTITUTIONS & ORGANISATIONS IN INTERACTIVE INNOVATION

Chair: Boelie Elzen and Leanne Townsend

Susanne Von Münchhausen. Are advisors the primary providers of innovation support services in forestry and agriculture? Preliminary findings from the Project LIAISON.

Sean Kenny. Forces shaping innovation capacity: the role of organisations and institutions in enabling multi-scale change in Australian agriculture.

Evelien Cronin and Jekaterina Markow. Unravelling system failures within European multi-actor co-innovation projects in agriculture: a comparative analysis.

Elizabeth Dooley. A deep dive into farmer discussion groups through the lens of social learning theory.

S1.7 – WEDNESDAY 13, 14.00–15.30. *Room 124*

WORKSHOP | INTERACTIVE INNOVATION IN AGRICULTURE, FORESTRY AND RURAL DEVELOPMENT: LEARNING FROM PRACTITIONERS TO IMPROVE PRACTICE – SOME LESSONS FROM THE LIAISON PROJECT.

Chair: Susanne von Münchhausen

S1.8- WEDNESDAY 13, 14.00–15.30. *Room 007*

EDUCATION, TRAINING & RESEARCH IN INNOVATION SUPPORT SYSTEMS

Chair: Alex Koutsouris

Lies Debruyne. Development of agroforestry 'masterclasses' to overcome potential barriers in the Flemish context.

Lisette Tara Phelan. Photovoice: a research method for farmer-driven knowledge production.

S1.9 – WEDNESDAY 13, 16.00–17.30. *Room 007*

WORKSHOP | ASSESSING THE AGRICULTURAL KNOWLEDGE AND INNOVATION SYSTEMS (AKIS) PLAN: ESSENTIALS TO ENABLE THE EFFECTIVE INTEGRATION OF ADVISORS WITHIN THE AKIS'S

Chair: Patrizia Proietti and Simona Cristiano

S1.10 – THURSDAY 14, 09.00–10.30. *Room 007*

EXTENSION METHODS IN INNOVATION SUPPORT SYSTEMS

Chair: Fleur Marchand and Lies Debruyne

Fleur Marchand. Reflecting on on-farm demonstrations as tactile spaces to foster sustainable agriculture.

Eleni Zarokosta. The role of facilitators in farmers' discussion groups.

Christopher Agyekumhene. Facilitating trust for collaboration in smallholder valuechains: a case for digitalisation?

THEME 2 – THE INTERSECTION OF SCIENCE AND PRACTICE: FARMING SYSTEM PERSPECTIVES

Agricultural sciences have to operate at the interface between technological, economic, political, natural, social and different knowledge systems. At the farm scale, science also has to intersect with the complex decision making environment, which presents certain challenges, risk and responsibilities.

Agricultural science can provide benefits of systematic observation, measurement and experiments, rigorous replicable methods, large data sets and analysis, however, how to make the outputs relevant to different production and management/decision contexts is a persistent question. Criticisms of uncertainty and lack of transparency are particularly pertinent to science supporting climate change adaptation.

Given the increasing reliance placed on science advancements, the need to understand how science intersects with practice is becoming more pressing; whether with respect to sophisticated modelling and big data, the promotion of concepts such as smart farming, sustainable intensification and ecological modernisation, or supporting farmers' adaptation to climate variability and resource challenges.

S2.1 – MONDAY 11, 14.00–15.30. *Room 110*

PARTICIPATORY APPROACHES FOR THE SCIENCE-PRACTICE INTERFACE

Chair: Andrea Knierim

Naulleau Audrey. Adapting viticulture to climate change: a participatory scenario design within a Mediterranean catchment.

Dominik Noll. Facilitating a sustainability transition of the livestock farming system of Samothraki, Greece.

Romane Vanhakendover. Involving stakeholders in the definition of pathways to more sustainable beef farming systems.

S2.2 – MONDAY 11, 16.00–17.30. *Room 110*

ANALYTICAL APPROACHES AT THE SCIENCE-PRACTICE INTERFACE

Chair: Julie Ingram

Aline Fockedey. How to face the challenge of analysing the results of on-farm experiment to support participatory research schemes?

Chris Stoate. A landscape scale experiment to test practical measures to deliver multiple agricultural and environmental benefits.

Esther Fouillet. Reducing pesticide use in vineyards. Evidence from the analysis of the French dephy-network.

Laure Hossard. Assessment of the resilience of farming systems in the Saïss plain, Morocco.

S2.3 – WEDNESDAY 13, 11.00–12.30. *Room 115*

NEW PERSPECTIVES AT THE SCIENCE-PRACTICE INTERFACE

Chair: Patrizia Proietti and Simona Cristiano

Jana Zscheischler. Transdisciplinary innovation processes towards sustainable land management.

Julie Ingram. The cumulative tradition of decision support systems research: new perspectives on success.

Andrea Wiktor Gabriel. Management practices of residual biomasses: a metabolic networks perspective.

S2.4- WEDNESDAY 13, 16.00–17.30. *Room 124*

WORKSHOP | FARMER-LED RESEARCH AND INNOVATION: UNDERSTANDING THE PROCESSES AT THE FARMER AND SCIENTIST INTERFACE?

Chair: Lisa van Dijk and Julie Ingram

THEME 3 – AGROECOLOGY AS A RESPONSE TO CLIMATE CHANGE

Agriculture faces many different challenges and has partly lost its connections with nature and with society. This led to several undesired and mostly unforeseen negative consequences. The search for more sustainable pathways for agriculture development has shifted the focus of attention from individual practices at field level towards the farm dimension, farm organisation (ex. in terms of autonomy), farm landscape cooperation (ex. in terms of biodiversity), and even food issues. In all cases, reconnections or new connections between agriculture and its environment (weather nature or society) must be redesigned and created.

iPES FOOD confirms: "What is required is a fundamentally different model of agriculture based on diversifying farms and farming landscapes, replacing chemical inputs, optimizing biodiversity and stimulating interactions between different species, as part of holistic strategies to build long-term fertility, healthy agro-ecosystems and secure livelihoods, i.e. 'diversified agroecological systems'."

S3.1 – MONDAY 11, 14.00–15.30. *Room 115*

LIVESTOCK MANAGEMENT AND OTHER DYNAMICS IN AGROECOLOGICAL SYSTEMS

Chair: Marc Tchamitchian

Benoît Dedieu. What prospects for work in agriculture in the world?

S3.2- MONDAY 11, 16.00–17.30. *Room 124*

BOOK PRESENTATION | GOVERNANCE FOR MEDITERRANEAN SILVOPASTORAL SYSTEMS: LESSONS FROM THE IBERIAN DEHESAS AND MONTADOS (ROUTLEDGE, 2021).

Chairs: Teresa Pinto-Correia, Maria Helena Guimarães, Gerardo Moreno, Rufino Acosta Naranjo

S3.3 – WEDNESDAY 13, 14.00–15.30. *Room 115*

AGROECOLOGY IN PRACTICE AND RESILIENCE BUILDING

Chair: Fleur Marchand

Ulysse Le Goff. Building farm system resilience in Canton de Vaud, Switzerland.

Marine Albert. Assessment of vulnerability to climate change of maize farming systems: designing an indicator set based on farmers' perceptions and knowledge.

Sara Burbi. Can we push agroecology a step further?

Jan Landert. Combined farm sustainability assessments: how are agro-ecological practices captured by different assessment tools?

S3.4 – THURSDAY 14, 09.00–10.30. *Room 115*

DETERMINANTS, FACTORS AND CHALLENGES IN APPLYING AGROECOLOGY

Chair: Marc Tchamitchian

Marc Tchamitchian. Horticultural agroforestry: the challenge of diversification services.

Ana Fonseca. Retro-innovating around acorn production in Portugal.

Stéphanie Domptail. Decolonizing nature? Worldviews of agroecological farmers in Germany, and implications for reconnection with society.

Bertille Thareau. Conception of local carbon markets connecting farmers and enterprises: socio-economic outlines of innovation devices.

Anda Adamsone-Fiskovica. Making the agroecological turn: identification of farm-level sociotechnical adoption, factors and determinants.

THEME 4 – FOOD SYSTEMS, NETWORKS AND POWER STRUCTURES

Agri-food systems are among the most important human-environmental systems that shape our society. The sustainability of food systems is essential for food security and nutrition. Today, many of the current food systems have lost their connection with nature and/or with society and their sustainability is threatened by diverse challenges such as climate change, price volatility, food safety and consumer mistrust. To tackle these challenges, systemic changes in structure (e.g. networks and power structures), practices (e.g. rules and habits) and culture (e.g. norms and values) are required.

Creating spaces for collective action seems to be an effective strategy in reducing uncertainties and increasing transformative capacity. This requires collective action, which current governance structures and power are often restraining. Although agri-food networks are emerging and can be successful at a small scale, these networks often fall short of reaching their goal to bring about change at agri-food system level. Among the possible barriers is the fact that both practice and research remain focused on how innovations and sustainability practices are shaped at individual firm level, while agri-food systems and networks – as dynamic complex systems – are strongly interconnected. Furthermore, the urban-rural fringe is a still existing dichotomy in food systems studies. We need to find systemic approaches to look beyond these dichotomies and to realise new and re-connections. This is required not only in research but also in policy and practice. The challenge is also to learn how conventional food systems can (re)connect with nature and society in order to increase their transformative capacity.

S4.1 – WEDNESDAY 13, 11.00-12.30. *Sala de Docentes*

WORKSHOP | CHALLENGES FACED BY LARGE EUROPEAN PROJECTS DEALING WITH AGRICULTURE AND FOOD SYSTEMS: EVIDENCE FROM THE H2020 SALSA PROJECT.

Chairs: Maria Rivera Méndez, Paola Hernández, Teresa Pinto-Correia and Dionisio Ortiz Miranda

S4.2- MONDAY 11, 11.30–12.30. *Room 115*

RURAL DEVELOPMENT FROM A TERRITORIAL PERSPECTIVE

Chair: Esther Sanz Sanz

Zollet Simona. Organic regions as a model of endogenous territorial development? Contrasting and contested development pathways in the Belluno province, Italy.

Mikelis Grivins. Linkages between agriculture and forestry in food production: building resilience of rural communities.

S4.3 – WEDNESDAY 13, 11.00–12.30. *Room 110*

THE WAY FORWARD FOR A HOLISTIC VISION OF FOOD SECURITY

Chair: Louis Tessier

Michel Mouléry. Food security in the Mediterranean basin with an analysis in machine learning.

Annemarieke De Bruin. A just transition? Justice principles relevant to food system transitions.

Esther Sanz Sanz. Local food sufficiency in the Mediterranean basin – enabling and constraining factors.

S4.4 – WEDNESDAY 13, 16.00–17.30. *Room 008*

SUPPORTING NETWORKS AND THEIR IMPLICATION ON SUSTAINABLE FOOD SYSTEMS

Chair: Fleur Marchand

Marion Sautier. 'I am sure their vet is their main adviser': complementary network structures and innovative potential in sheep farming.

Chloé Le Bail. Transition towards sustainable food systems: a focus on work, workers and workplaces.

Patrizia Borsotto. The construction of networks in Italian social farming.

S4.5 – THURSDAY 14, 09.00–10.30. *Room 110*

SMALL IS BEAUTIFUL: STRUCTURAL CHANGES IN FOOD PRODUCTION AND VALUE CHAINS

Chair: Louis Tessier

Véronique De Herde. Defining pathways of transition towards a diversified milk valorisation: what the historical evolution of Walloon dairy cooperatives tells us.

Myriam Grillot. Interactions between agricultural value chains at local level: a metabolic approach.

Anton Riera. Learnings from a prospective approach in the livestock sector in Belgium.

Louis Tessier. Pursuing agroecological principles at Flemish beef farms: the role of farmer agency alternative marketing arrangements.

THEME 5 – SMART TECHNOLOGIES IN FARMING AND FOOD SYSTEMS

Smart Farming indicates the application of different forms of digitalisation in the agriculture sector, such as sensor driven agriculture (e.g. Precision Farming), the use of Big Data for analytical purposes to inform decision making, application of the Internet of Things (e.g. in quality control, producer-consumer relationships), and (autonomous) devices such as robots and drones. Digitalisation is not only a technological matter. It is also associated with new actors from outside agriculture (SMEs, upstream and downstream, service firms, etc.) and with new relations between actors. Whilst the potential benefits of these technologies are very easy to understand at a local scale, their potential impacts on farming systems have not been fully evaluated. Digitalisation is likely to affect and possibly disrupt the agricultural sector beyond the farm gate, influencing supply chain processes, logistics or consumer related information, knowledge and innovation systems, and can have pervasive social, economic, ecological and ethical consequences.

S5.1 – MONDAY 11, 11.30–12.30. *Room 124*

WORKSHOP: SUSTAINABLE DIGITALISATION FOR RURAL AREAS: HOW TO MAKE ECOLOGICAL AND DIGITAL TRANSITION CONVERGE?

Chairs: Julie Ingram, Pierre Labarthe, Leanne Townsend and Dominic Duckett

S5.2 – WEDNESDAY 13, 16.00–17.30. *Room 110*

ASSESSING THE FUTURE OF SMART FARMING

Chair: Laurens Klerkx

Noémie Bechtet. How digitalisation affects the capacity of the farming sector to assess innovation? The case of digital decision support tools for fertilisation in France.

Vasiliki Kanaki. Exploring the adoption of innovative spraying equipment.

Andrew Terhorst. Foresighting the future of digital agriculture: four plausible scenarios.

Michel Kabirigi. Potential of using ICT for effective Banana Xanthomonas Wilt (BXW) prevention and control amongst banana growers' clusters in Rwanda.

S5.3 – THURSDAY 14, 09.00-10.30. *Room 124*

SMART TECHNOLOGIES IN FARMING AND FOOD SYSTEMS

Chair: Julie Ingram

Davide Rizzo. Is farming technology innovation locus dependent? Making-of an agricultural Fab Lab.

Evagelos Lioutas. Smart farming and short food supply chains: two diametrically opposed alternatives or two sides of the same coin?

Eléonore Schnebelin. Digital: a source of convergence or divergence between organic and conventional farming?

THEME 6 – LANDSCAPE INTEGRATION OF FARMING

Governance actors, networks and their mutual interactions are key drivers of the (past, present and future) trajectories of change in land-use and farming systems. This process is enacted across a wide range of spatial-temporal scales and institutional levels. Alas, the divergences in the interests and aspirations of these different actors and institutions (both public and private) make it difficult to reach consensus on directions for achieving more productive agronomical and forestry-systems that can be integrated with other land-uses and related socio-political objectives, including biodiversity conservation, economic diversification and climate change mitigation and adaptation. To tackle these challenges, many theoretical and operational frameworks and tools have been proposed, including Ecosystem Services and an Ecosystems Approach, and Social-Ecological Systems and Resilience. Nonetheless, few aspects of these frameworks have been translated from theory into real-world management. Furthermore, existing land management systems that are intrinsically multi-functional and thus can foster sustainability (e.g. Mediterranean silvo-pastoral systems, such as Dehesas and Montados) are currently in decline. This is largely due to inadequate governance frameworks and market inefficiencies.

In such a context, Landscape Approaches can seemingly provide an opportunity to link diverging land-use actors and objectives to converge through more innovative governance and decision-making structures, ultimately contributing to integrate agriculture and forestry alongside other rural land-uses. This is a context where biodiversity conservation and carbon sequestration are largely menaced from a rapid and uncontrolled expansion of agriculture, and thus where landscape functional and ecological capacities can help address problems of connectivity and sustainable farming production. Alas, they have also been proposed in regions with a long history of human intervention where both cultural and natural values have long co-existed with, or even at times depended, on agriculture and forestry (e.g. the Mediterranean), and thus, where Landscape naturally provides the much-required bridge between food production and other benefits and services to be potentially obtained from the land, such as cultural ones. Last, Landscape is also considered as a spatial-temporal scale, and more concretely, as a scale to which decision-makers and land-managers operating on the ground can relate, thus being useful for land-management coordination and cooperation.

S6.1 – WEDNESDAY 13, 11.00–12.30. *Room 124*

LAND SYSTEMS DYNAMICS IN THE MEDITERRANEAN BASIN – DRIVERS AND FUTURE PERSPECTIVES

Chair: Maria Helena Guimarães and Marta Debolini

Marta Debolini. Specialisation, abandonment and periurbanisation trajectories on Mediterranean land systems. A participatory analysis for the case study of the Comtat Venaissin (Southern-East France).

José Muñoz-Rojas. Trajectories of change in olive grove expansion and intensification in the Alentejo (Portugal): testing a landscape approach towards more sustainable futures.

Catarina Esgalhado. Mapping preferred trajectories of local development in Southeast Portugal.

Elisa Marraccini. Actors, scales, spaces and dynamics linked to groundwater resources use for agriculture production: drivers of change and future perspectives of the territory in Haouaria Plain, Tunisia- a territory game approach.

S6.2 – WEDNESDAY 13, 14.00–15.30. *Room 110*

STAKEHOLDER INVOLVEMENT, LAND PLANNING AND GOVERNANCE ACROSS SCALES

Chair: José Munoz-Rojas

Daniele Vergamini. Learning through scenarios to support the sustainability of EU farming systems.

Carolina Yacamán. Green infrastructure for ecological and strategic territorial planning to improve the integration of agricultural landscapes.

Clementine Meunier. Farmers' perceptions of levers and barriers to crop-livestock integration beyond farm level. A case-study in France.

S6.3- WEDNESDAY 13, 16.00–17.30. *Room 115*

AGRICULTURAL LANDSCAPES, AGROECOLOGY AND PATTERNS OF BIODIVERSITY

Chair: José Muñoz-Rojas

Maria Kernecker. Using transition zones to re-think biodiversity-yield relationships in agricultural landscapes.

Maria Busse. Co-design of insect-friendly farming systems at landscape level.

Claudine Thenail. What learning arrangements to accompany innovating agroecological management of landscape resources across scales? Lessons from three case studies in Western France.

Dominic Duckett. Rewilding the risk society on small farms.

Gabriel Gonella. Interactions between beekeeping and livestock farming systems in agropastoral landscapes: a case study in Southern Massif Central, France.

Cornelia Grace. The heartland project: one health from soil to society.

ABSTRACTS

KEYNOTES
Monday 11, 09.00–10.45. Auditorium
Chair: Teresa Pinto-Correia

AGRICULTURE AND TERRITORIAL COHESION IN PORTUGAL: AN ECOLOGICAL AND POLITICAL PERSPECTIVE

HELENA FREITAS
University of Coimbra, Portugal

The Portuguese agro-food sector faces a number of threats, including climate change, globalisation of goods and services and land use changes related to the abandonment of primary activities among the most worrying. The natural and progressive qualification of family farming will eventually drive other equally relevant areas, in particular the design of innovative cooperatives, the establishment of appropriate producer organisations, and proximity markets. Placing family farming at the centre of the sector's public policies is a fundamental strategic movement for the cohesion and sustainability of the territory, for the wellbeing of the Portuguese, for the preservation of the environment and for the safeguarding of biodiversity.

THE CONTRIBUTION OF FAMILY FARMING TO FOSTER SUSTAINABLE FOOD SYSTEMS

SÉRGIO SCHNEIDER
Federal University of Rio Grande do Sul, Brasil

The presentation will address the challenges and perspectives of the family farming in a globalized world in which the food production and consumption has become a system dominated by global value chains upstreams and a small handful of supermarkets downstream. Family farming might be the best way to develop a sustainable agriculture committed with the SDGs and the nutrition transition, in line with an agriculture sensitive to nutrition approach and the new demands from the urban people. Family farming has great potentialities to develop sustainable food systems, which is an emerging concept that can be critical in the context of the Decade of Family Farming, just launch by FAO.

KEYNOTES

Wednesday 13, 09.00-10.30. Auditorium
Chair: Andrea Knierim

COLLABORATIVE STRATEGY MAKING FOR AGRARIAN LANDSCAPES

JØRGEN PRIMDAHL
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The agricultural landscape is affected by a multitude of public policies linked with climate change, biodiversity conservation, environmental protection, rural development, land and food markets, and urbanisation in various forms including counter-urbanisation. Although the individual farmer – as a producer and as a land owner – is a main policy target, coordination at the landscape scale is often required. Using the unifying dimension of the landscape concept a 'landscape approach' has been suggested – and widely accepted – to integrate different policy domains through collaborative processes and to balance competing land use demands to satisfy both ecological and human demands. Landscape strategy making represents a way to bring together the different components of a landscape approach. Based on experiences with experimental projects and inspired by spatial planning theory a framework for landscape strategy making is outlined and illustrated by a fresh example of a strategy for a Danish river valley dominated by agriculture.

CHALLENGES FOR FARMING SYSTEMS RESEARCH: LEARNING EXPERIENCE AND LOOKING AHEAD

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Farming systems research has always strived to integrate both natural and social sciences, taking into account agricultural production methods and farmers' views. This integration is rarely easy, but crucial. As the current discussion on climate change or the unsustainable use of natural resources shows: it is easier to study and present the scientific facts about agro-ecosystems, than to motivate people to adapt their practices. Yet, to face the impacts of climate change and to manage our resources sustainably, we will need to change our practices, both in research and in society at large. In the closing plenary I will build on the presentations and discussions held at the IFSA 2022, reflecting on the progress we have made over the past decade or so, and identify some issues that would merit more attention within farming systems resear

NEW CHALLENGES FOR INNOVATION SUPPORT SERVICES TO IMPROVE COCOA QUALITY AND SUSTAINABILITY IN CAMEROON

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Cameroon is the fifth cocoa producer in the African continent. The provision of support services for cocoa sectors experienced transformation during the beginning of the 90's. In fact, with liberalization, the cocoa sector suffered from the effects of the disengagement of the State in production and post-harvest support, and in regulation of the cocoa market and prices. A decline in cocoa quality and production volumes have resulted from this situation. The National policy to relaunching cocoa sector has raised interest to develop cocoa quality. In a context of competitive cocoa world market, this strategy should provide lucrative opportunities through niche innovations. Our central assumption is that this strategy is mainly related to a transformation of mindsets of the actors within the cocoa value chain, which should be supported by specific services. In this paper, our focus is oriented to the existence of innovation services dedicated to support improvement of cocoa quality through the identification and characterization of providers and services provided. Semi-structured interviews have been carried out with 16 service providers identified and selected. Our results showed a multiplicity of actors, both formal and informal, involved in provision of cocoa quality support service. Various services are provided: access to resources, capacity building, access to market, networking, advice and agricultural information. A majority (12) of respondents declares that they are building the capacity of cocoa farmers and only one of them accompanies cocoa farmers to gain access to the market. Training on good agricultural practices for production and post-harvest processing are the most important services to enable producers to improve the quality of cocoa, followed by the networking of producers and the provision of inputs to producers. The main beneficiaries of these services are both farmers' organizations and individual farmers. In almost all the cases, they do not apply to gain access to services. The problem of finance remains the major constraint faced by these beneficiaries. These results bring out reflections on the consistency between the actual offer of innovation support services and the transformations that should be supported to increase cocoa quality. We conclude by identifying challenges to develop new services taking into account various systemic levels and including technical as well as organizational aspects (e.g. improvement of farmers and farmers' organizations technical and financial capacities, development of reliability on cocoa quality, creation of better connections between farmers and the formal value chain).

REGIONAL AND SUB-SYSTEM SPECIALISATION OF INNOVATION SUPPORT SERVICES PROVIDED IN MADAGASCAR: WHAT KIND OF IMPACT CAN BE EXPECTED FOR FARMERS?

Narilala Randrianarison[a], Sarah Audouin[b,c], Harilala Andriamaniraka[a], Tovo Ratsimbazafy[d], Andriamparany Ranoasy[d], Andrianjafy Rasoanindrainy[e], Patrick Dugué[c], Tim Ndah[f]

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Agricultural innovation is acknowledged as a driver for rural development, particularly regarding southern countries situations, where the agricultural sector is the main activity for rural population. The SERVInnov project aims at strengthening innovation support providers' (ISP) capacities to provide efficient and relevant services to innovators to enable them to successfully overcome problems and improve their livelihoods. This communication presents empirical results from Madagascar, by mobilizing AKIS and ISS frameworks. It focuses on organizational and spatial diversity of services provided to innovators. We studied 5 agricultural innovation subsystems (IsubS), namely staple food, exportation crop, organic farming, poultry farming and digital agriculture. We selected 4 administrative regions, localized in the centre highland area of Madagascar, encompassing similar biophysical conditions but with different cropping systems and economic situations: Itasy, Vakinankaratra, Amoroman'i, Analamanga. The method consisted on ISP and services characterization. Then, we identified trends regarding any specialization or homogenization among ISP, ISubS and spatial units. Results show that services provided are specific to IsubS, and rely on several specialized ISP. For example, exportation crops IsubS are mainly composed by market-oriented services, through support to farmers' organisations, tracking of food products and contract farming, and are mainly provided by private organisations. Staple food and organic farming IsubS are dominated by technical advices provision through training and demonstration plots, mainly provided by public organisations, funded by international donors, whereas poultry farming IsubS focuses on access to resource like inputs and equipment. Digital agriculture IsubS is a really recent sector, hence services are mainly related to advisory and information sharing through mobile phone, currently provided by private organisations but also by few research centres. Regarding spatial allocation of ISP, exportation and poultry IsubS are mainly localised in regions close to the capital. Staple food IsubS is mainly concentrated in the Vakinankaratra region, thanks to its high diversity of staple crops. ISP in organic farming IsubS intervene in specific regions, illustrating an implicit spatial distribution strategy. These results raise concerns about the real efficiency regarding services relevance and ability to reach innovators' needs. On one hand, services specialization according to IsubS hinder systemic approach of farming-systems, whereas households' resilience in highland area of Madagascar relies on diversification of farming activities. Then, spatial distribution of services and ISP may imply that provision of services are unequally accessible for farmers, and through different approaches, values and tools.

SUPPORTING AGRICULTURAL AND AGRI-FOOD INNOVATIONS FOR STAPLE FOOD PRODUCTION IN CAMEROON: PLURALISM OF ORGANIZATIONS, DUPLICITY AND DISCONTINUITY OF SERVICES

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The innovation systems approach is an analytical framework that is increasingly used to address agricultural innovation support services (ISSs). In the staple food production sector of Cameroon, a plurality of innovation support service providers (ISPs) co-exist, but ISSs are largely delivered within the framework of agricultural and rural development projects or programs. This paper aims to assess the impact of such governance mode on ISS delivery. Using a mixed research approach, empirical data have been collected focusing on the cassava innovation sub-sector in Southern region of Cameroon. ISPs at the local, regional and national levels (n=11) were first identified through literature review. Semi-structured questionnaires were administered to this first sample in order to create an ISP and projects database. A second semi-structured questionnaire was then administered to an enlarged group of ISP respondents (n=27) in order to characterize ISPs and ISSs, as well as to identify and measure the interactions among ISPs. Results indicate that public international and national ISPs dominate the system (high number of projects, ISSs and interactions with other ISPs), and that this leads to duplicity of certain types of services. The private sector and Farmer-Based Organizations (FBOs) are also present and offer rather complementary ISSs, but their number is comparatively lower. The lack of intermediary services to coordinate the overall ISS system, the rather low density level of ISP interactions and their informal quality give the impression of a fragmented ISS system. But, the interactions among ISPs are actually essentially very uneven. Although international public ISPs already interact well with FBOs, partnership strategies towards national public ISPs still need to be implemented. In turn, national public ISPs should also strengthen their links with these FBOs. Overall, ISSs delivered by national and international public ISPs, as well as by the FBO umbrella organization (PROPAC) are mainly funded on project bases, which raises the risk of service discontinuity. Multi-actor partnerships and innovative mixed funding strategies need to be supported to improve the efficacy and the quality of ISSs delivery.

SESSION 1.2. WORKSHOP: STIMULATING INTERACTIVE INNOVATION IN AGRICULTURE: HOW FAR DID WE COME? AND HOW DO WE CONTINUE?

Monday 11, 11.30-12.30, Room 008

Chair: Eelke Wielinga and Patrizia Proietti

Interactive innovation is the leading theme in many EU funded projects in Europe. During the ESEE seminar in 2021, hosted by The Agriculture and Food Development Authority (TEAGASC), Ireland, a joint session was organised with contributions from twelve major international projects in the period 2015 - present, in order to find out similarities, differences, common barriers and opportunities for stimulating synergy.

The projects that contributed are Euraknos / Eureka, IPM, Plaid, AgriDemo, Nefertitti, FairShare, AgriSpin, i2connect, AgriLink, Liaison, Uniseco and NextFood. The conclusions of this event have not been published so far.

IFSA22 is an opportunity to share the results with the scientific community, and to discuss which issues arise from it for both the scientific and the political agenda. This workshop aims to create space for interaction, and input for a final version of an article to be published and sent to the European Commission.

SESSION 1.3. BETTER UNDERSTANDING THE ROLE OF ADVICE IN FARMERS' DECISION MAKING – RESULTS FROM THE AGRILINK PROJECT
Monday 11, 14.00-15.30, Room 007
Chair: Pierre Labarthe

INNOVATING AMIDST A WEAK AND FRAGMENTED AKIS: EXPLORING THREE GREEK CASES

Alex Koutsouris, Eleni Zarokosta

Agricultural University of Athens

Based on the idea of farmers' micro-AKIS (Agricultural Knowledge and Innovation Systems), developed within the AgriLink (HORIZON2020) project, three innovative Greek cases are explored aiming at identifying the actors (and their roles) who supported farmers along the innovation process (from awareness, to assessment and to implementation), following the 'Triggering Change' model claiming that major changes in farming occur as a result of trigger events that deviate farmers from the dependency path they are locked-in and bring them in a fragile position while searching for support in assessing and implementing innovations. The innovative cases explored concern: a) the cultivation of stevia in the area of Karditsa (Central Greece); b) the cultivation of avocado in Chania (Crete); and c) the implementation of a method of sexual confusion of insects in the framework of Integrated Pest Management in Imathia (Northern Greece). These innovations took off amidst the weak and fragmented Greek AKIS, notably the demise of the public Greek extension service. And while there has been a number of studies exploring this at the macro-level, the utilization of the concept of micro-AKIS, on the one hand, sheds light on the question of who supports farmers (at the local level) to take up innovations and, on the other hand, supplements the macro-level studies.

THE ROLE OF ADVISORY SERVICES IN THE UPTAKE OF SMART FARMING TECHNOLOGIES: EVIDENCE FROM THREE COUNTRIES

Leanne Townsend[a], Christina Noble[b], Marta Mrnustik Konečná[c], Gunn-Turid Kvam[d], Lívia Madureira[e], Noemie Bechtet[f], Pierre Labarthe[g]

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Smart farming technologies (SFTs) such as variable rate precision farming, milking robots and smart sensors can lead to better productivity, yields and cost savings as well as supporting more environmentally sustainable farming practices. Despite these advantages and the growing prevalence of SFTs, patterns of adoption vary within regions and across European countries. This is in part due to characteristics of specific farms such as farm size and type, as well as changing advisory landscapes with services becoming more fragmented, and challenges for advisors and policy makers in keeping up to speed with technological developments and the changing structures of farms.

In this paper we present findings from five case studies (UK, Czech Republic, France, Portugal and Norway) exploring the role of advisors in the uptake of SFTs. We discuss the factors affecting adoption of SFTs. We focus on the role of microAKIS on decision making in innovation adoption. Finally, we reflect on the implications of these findings on the future roles of advisory services in relation to supporting farmers' decision making in relation to SFTs.

ADVISORY SUPPORT ON NON-TECHNOLOGICAL INNOVATIONS ON FARMS: THE CASE OF DIRECT MARKETING

Livia Madureira[a]; Carla S. Marques[a]; Ana Barros[b]; Cristina Micheloni[c]; Davide Zimolo[c]; Anda Adamsone-Fiskovica[d], Irina Toma[e], Ana Barandiaran del Olmo[f]

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The search for sustainability of EU farmers, especially from the economic point of view and particularly in the case of small and medium size farms, has led to several attempts of introducing organisational and marketing innovations, not linked to new products of new technology. Often these innovations are implemented through collective approaches – a factor that along with its positive effects also brings various challenges and requires specific skills. The paper addresses the question of if and how are the Farm Advisory Systems (FAS) supporting farmers in the implementation of non-technological innovations in various countries and in different social environments. It also aims to understand what skills and knowledge are required for a successful implementation of organisational and marketing innovations and who can provide this knowledge and skills to farmers. This research is based on five case studies carried out in the H2020 AgriLink project. These cases pertain to the use of direct marketing by farmers, in collective or individual form, in Italy, Portugal, Latvia, Spain, and Romania. The paper advances our understanding of the present and prospective role of agricultural advisory services in the domain of non-technological innovations. The obtained results also address the needs of FAS in terms of training and innovative work modality in order to be supportive to farm-level innovation adoption. Furthermore, the role of new actors in the AKIS (Agriculture Knowledge and Innovation Systems) are discussed and recommendations for policy-makers and rural development agents are provided.

ENABLING ENVIRONMENTAL INNOVATIONS ON FARMS: WHAT IS THE ROLE OF FARM ADVISORY SERVICES?

Sandra Šūmane[a], Emīls Ķīlis[a], Daan Verstand[b], Ellen Bulten[b], Jorieke Potters[b], Noelia Telletxea Senosiain[c], Lívia Madureira[d], Eleni Zarokosta[e], Alex Koutsouris[e]

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Growing concerns over the environmental impact of food production are giving rise to a range of environmental innovations in agriculture. Among them, biological and integrated pest control (B/IPC) are seen as tools to reduce pesticide use, enhance biodiversity, improve water quality, limit adverse health impacts on producer and consumer, and mitigate climate change caused by agriculture. Despite these benefits, B/IPC techniques have not been widely adopted by the farming community. To encourage a more widespread use of B/IPC on farms, farmers' access to knowledge and advice about these methods is of key importance. In this paper, we use the cases of B/IPC to explore the role of farm advisory system in supporting the implementation of environmental innovations on farms. By farm advisory system we understand the set of actors - both formal and informal, individuals and organisations - who provide farmers with the advice necessary to operate a farm. We focus on farmer perspective to investigate farmers' perceptions on B/IPC, the principal sources of advice on B/IPC that farmers consult, interlinks of different sources and outcomes. We identify good practices in providing knowledge and advice to farmers, as well as gaps in the provision of advice. The paper is based on five case studies of farm advice in the field of B/IPC carried out as part of the ongoing Horizon2020 project AgriLink. These case studies include the method of sexual confusion of insects in Greece, biological plant protection methods in Latvia, biological control of grapevine pests in Portugal, integrated pest management in Spain, and tagetes cultivation for nematode control in the Netherlands. Data was gathered through semi-structured interviews with farmers, advisors and experts and analysed according to mixed quantitative and qualitative methods. The preliminary results suggest a wide range of knowledge sources and advice that farmers rely upon and combine when implementing environmental innovations. However, there are also some discrepancies and gaps in the provided advice, and disconnections between advisory and knowledge actors. There is a necessity for improvements in agricultural education and the formal advisory support provided to farmers implementing environmental innovations. More specifically, better cooperation between farmers, researchers and advisors is needed to co-create locally-specific knowledge. This finally will facilitate a wider uptake and better-informed use of the B/IPC methods, enhancing farmers' ability to distinguish valuable knowledge from information and taking better advantage of peer to peer learning opportunities.

SESSION 1.3. BETTER UNDERSTANDING THE ROLE OF ADVICE IN FARMERS' DECISION MAKING – RESULTS FROM THE AGRILINK PROJECT
Monday 11, 14.00-15.30, Room 007
Chair: Pierre Labarthe

IMPROVING FARMING ADVISORY SERVICES TO STIMULATE DEVELOPMENT OF SUSTAINABLE AGRICULTURE

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European agriculture faces several sustainability issues that require various types of innovations (technological and social). Farming advice and farming advisors play in important role in this innovation process. This paper is based on the ongoing EU funded AgriLink project that develops new insights in how farming advisory systems (FAS) can operate to assist farmers in addressing the new challenges that they are facing. This also raises new challenges for advisory services that target the farm level, including the governance of advisory services at regional and national levels, the overall coordination of the system and the types of innovation that are at stake. The research is based on an analytical framework that integrates concepts that operate at different levels, including the farm level, the wider agricultural system (the innovation environment), and policy and institutional environments. For each of these levels, the project analyses its role in the innovation process with a specific focus on sustainability issues in a set of eight domains of agriculture ('innovation areas'). An integrated assessment of all these factors is facilitated by the use of several frameworks, including the triggering change model, the multilevel perspective (MLP), and insights from organisational learning. The analysis is based on case studies from thirteen countries across Europe which allows the analysis at each of the indicated levels for various agricultural domains in different innovation contexts.

STRENGTHENING THE ROLE OF INNOVATION BROKERS IN LIVESTOCK ADVISORY SERVICES OF PAKISTAN

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Innovation brokers are an important component of agricultural advisory systems worldwide and have potential to impact household livelihoods in developing countries. Innovation brokers play a crucial role as systemic intermediaries that facilitate information flows, connect partners, articulate demands, communicate needs, facilitate linkages and other functions related to innovation processes. In developing sectors, such as in Pakistan, linear and top-down models of change continue to be the major components of the farm advisory systems. Transforming the role of farm advisors in these systems to innovation brokers presents major challenges. This paper aims to investigate the knowledge and skills required to transform individuals in linear-style farm advisory roles to play the role of innovation brokers within the livestock advisory services of Pakistan. The Whole Family Extension Approach (WFEA) was developed and is considered an Agricultural Innovation Systems (AIS) intervention in the livestock extension system of Pakistan. This research project is building the capacity of the AIS by scaling up the WFEA intervention through collaborative efforts with local extension partners. A network of 22 organisations (research, government, NGOs, private sector and international research organisations) with the common goal to improve smallholder livelihoods has been established. As part of the intervention, each organisation has designated up to four farm advisors to be part of a training program and a community of practice meeting (three days) after every six months about their roles in the farm advisory system. This includes training on various technical farming system modules and the opportunity to engage in a collaborative learning environment where individuals reflect on their own field experiences and the challenges they face. Data regarding the capacity building process from 50 farm advisors has been collected using two approaches; (1) through two reflective focus groups, July 2018 and December 2018, at the community of practice sessions and (2) during field follow-up visits for mentoring, monitoring and evaluation of the program. The results of this study conclude that regular capacity building trainings of farm advisors on the whole farming system, integrating female farm advisor, establishing trust and feedback mechanism among various actors involved in process, training on social mobilisation and communication skills of farm advisors are the key components to integrate the WFEA within the current farm advisory services in Pakistan. The framework proposed by Prager, et al. (2017) for the evaluation of farm advisory services could therefore be expanded for developing country contexts, including criteria on: capacity building of farm advisors; advisors meeting the diverse needs of farmers; support beyond technology transfer and support to streamline organisational extension programs.

DETERMINANTS OF FARMER'S DECISION TO JOIN A PARTICIPATORY EXTENSION PROGRAMME: A MIXED METHOD ANALYSIS OF NORTHERN IRELAND BUSINESS DEVELOPMENT GROUPS

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Innovation, in terms of product, process and practice is now at the core of the global agricultural policy agenda. There is an increased need for farmers to become more innovative in what has become a changing agricultural environment requiring the increased adoption of advanced technologies and sustainable management practices in order to improve productivity. The purpose of this paper is to examine and analyse farmers' decisions in relation to joining and participating in a new approach to farm extension learning and advisory service provision; namely the Business Development Groups (BDG) scheme in Northern Ireland. The BDG programme focuses on facilitating 'peer-to-peer' learning at the farm level. The approach provides farmers the opportunity to discuss farm business challenges with other farmers and to draw on knowledge and experience within the group. Making use of data from both primary and secondary sources, this study employs a mixed method approach which involve an empirical analysis of quantitative and qualitative data to examine the factors influencing membership of the BDG programme. The results of our analyses show that larger, more intensive farmers who are keen to access information from other farmers to improve their business performance are most likely to participate in the BDG programme. The study contributes to the empirical literature as it provides a comprehensive analysis of factors influencing the decision to join participatory extension programmes using a mixed method approach. The results of the analysis will provide evidence to inform future policy development in the area of participatory extension programmes.

ENABLING FARMERS' CONTINUOUS LEARNING THROUGH SOCIAL LEARNING PRACTICES - THE ROLE OF INNOVATION SUPPORT SERVICES

Lisa Blix Germundsson, Magnus Ljung

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Agricultural innovation policy increasingly emphasises farmers' continuous learning in multi-actor settings for knowledge development and innovation. The aim of this paper is to critically analyse the structural conditions for farmers' involvement in lifelong learning, and the role of innovation support services in supporting this. Within an exploratory case study approach, interviews with key stakeholders were analysed using a practice-based approach. The findings show that the overall structures and incentives enabling multi-actor learning opportunities of farmers and other actors are too weak. The practical implications are that there is a need to form working approaches that systematically build and uphold multi-actor networks, and innovation support services have a key role in this. The theoretical implications include the use of a practice-based approach, where the concept of practice offers a bridge between the structural conditions and the learning processes among involved actors.

TRANSDISCIPLINARITY IN AGRO-ECOLOGICAL RESEARCH: AN EVALUATION FRAMEWORK

Alexandra Smyrniotopoulou[a], George Vlahos[a], Gerald Schwarz[b]

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Acknowledging that sustainability issues demand new ways of knowledge production, the UNISECO H2020 project employs a transdisciplinary research approach in order to strengthen the sustainability of agro-ecological European farming systems. Transdisciplinarity is mainly performed through the Multi-Actor Platforms (MAPs), which are seen as the mechanism that brings together the project team and non-academic actors to encourage knowledge sharing and co-learning through participatory processes carried out in project's duration. The MAPs are established at the EU and the local (case study) levels aiming at co-constructing practice-validated strategies and incentives for the promotion of improved agro-ecological approaches. This paper is an attempt to review existing literature on the evaluation of transdisciplinary and participatory approaches in order to develop a monitoring and evaluation framework for assessing the process and outcome of interactions with the MAP members.

A BUSINESS MODEL FOR INNOVATION SUPPORT SERVICES - IMPROVING INNOVATION CAPACITY BY DEVELOPING A BUSINESS MODEL BASED ON CONCEPTS OF PHYSICAL PROXIMITY, DIGITAL COUPLING AND SHARED COLLECTIVE INTELLIGENCE (WEQ)

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Improving the Agricultural Knowledge and Innovation System (AKIS) has gained substantial attention during the CAP period 2014-2020. Innovation support services (ISS) and Innovation Brokers (IB) are considered to play a vital role in building bridges between different actors in the agricultural sector. By fostering co-creation they can e.g. support the quest for innovation to cope with the huge challenges the sector is facing, such as food security, climate change adaptation and mitigation or the over-exploitation of natural resources. However, the question remains of how innovation system knowledge and ISS activities can safeguard these core functions within AKIS beyond the limited lifetime of funded projects like EIP-AGRI projects. In Germany, a dedicated transdisciplinary team at the nexus of science and management conducted a dynamic and iterative management process to translate the strategic role of an ISS into a new business model for venture creation using a novel combination of business model elements. The business model elements were selected to create a) a financially sustainable support system for innovation, b) empower scientists, farmers as well as SMEs in the agri-food sector to develop new production and business opportunities, and c) generate socio-economic well-being and jobs in rural areas. They comprise concepts of proximity at the physical level, of digital coupling and of shared collective intelligence, thereby leading to a permanent cross-fertilisation of ideas, knowledge and experience between and beyond those actors (WeQ). The outcome was an ISS Hub organization in the Federal State of Brandenburg that has led to improved innovation activity level and the enhancement of the local AKIS. In this paper we describe the development of the ISS Hub organization to provide independent complementary services needed for improving and professionalizing knowledge and innovation transfer and commercialization from an action-research perspective. We assess how the resulting business model addresses the underlying issue of coupling by juxtaposing its main elements with the main characteristics of a system model for innovation given by Freeman as an outflow of the Maastricht Memorandum (1996). By outlining conceptual thinking behind the creation of an innovative business model for ISS we discuss how the individual elements foster their ability for knowledge transfer and increase their innovation capacity towards a faster adaptation within AKIS.

STRATEGIC FUNDING OF COMMUNITIES OF PRACTICE TO ACHIEVE POLICY GOALS: THE EXAMPLES OF MULTI-ACTOR INNOVATION PROJECTS IN THE FORESTRY SECTOR IN EUROPE

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Sustainable solutions to complex socio-scientific problems, such as the rural exodus that is evident in many parts of the world, require mobilization of a growing range of stakeholders with multiple perspectives. Informal communities of practice (CoPs), with high degrees of autonomy in processes and activities, have formed to address such problems by enabling social learning, which can lead to co-innovation to implement joint visions and create solutions. Funding bodies have the potential to further their own agendas by supporting CoPs when the values of the CoP align with the funding body's goals, but they tend to prescribe processes and activities as a condition of funding, which is inherently top-down. This paper explores the possibility of using top-down funding instruments to support bottom-up programs to achieve mutually desirable outcomes. We focus on three cases in rural communities in Norway, Sweden, and Austria in which funding bodies have supported communities of practice in the forestry industry and analyse the projects in terms of their internal and external interactions. This approach of funding bodies supporting CoPs by negotiating specific outcome goals, while allowing a high degree of freedom of process, was found to facilitate the cases to be dynamic in their interactions. The dynamism enabled them to achieve outcomes such as collaborations to establish a competence centre, an education program to showcase perspectives for girls in the forestry industry, and collaborations to find innovative applications for timber products. These outcomes each contribute to providing perspectives in the forestry industry for young people, which has implications for the viability of the communities and can contribute to stemming the rural exodus. We conclude that providing support to CoPs can indeed be used as a top-down tool to support bottom up processes to progress towards joint visions of desirable outcomes.

FARMER-LED INNOVATION NETWORK, AN EMERGING COMMUNITY OF PRACTICE IN THE UK

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Famer-led innovation initiatives (formal and informal) have had an increasing presence in the UK AKIS since the privatisation of advisory services, responding to a shift towards more farmer-centred thinking and opportunities for support. Intermediary organisations facilitating such initiatives typically using participatory approaches are funded through a variety of sources. These farmer-led initiatives can take different forms, all promote bottom-up and joint learning amongst farmers and relevant actors, bringing together a diversity of knowledge to tackle real on-farm problems. There is a growing interest from policy makers in these types of initiatives, and opportunities exist for enhanced integration of these approaches in future strategy and policy in the UK. To date there has been limited co-operation and coordination between the intermediary organisations described above, hence, there is a risk of fragmentation of the support landscape. At the end of 2018, the Farmer-Led Innovation Network (FLIN) was established to tackle the above-mentioned challenges, share knowledge and experiences and provide a collective advocacy voice for farmers directly involved in these initiatives. Currently, 19 organisations involved in farmer-led innovation and research initiatives are part of the network, including governmental and non-governmental organisations, research institutes, the levy board, farmer organisations and advisory services. The network is collectively working through workshops, working papers and commissioned research on:

- Development of better, more structured and monetarised evaluation of the success and effectiveness of these types of initiatives to provide evidence for policy making.
- Skill development for innovation facilitators and researchers to work effectively with farmer groups.
- Share and document best practices, drawing on the knowledge and experience of the organisations involved to develop working 'standards' or principles to ensure effective engagement with farmers and relevant actors.

This network can be described as a Community of Practice in that they are a group of people informally bound together by shared values, expertise and passion for joint enterprise. This paper presents the results of the ongoing work of this CoP to both understand, learn from and 'power up' farmer-led innovation initiatives in the UK.

LINKS BETWEEN THE ADVISORY SYSTEM BUILT BY DAIRY FARMERS AND THEIR REPRESENTATIONS OF THE AGROECOLOGICAL MANAGEMENT OF ANIMAL HEALTH

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Today's farming is subject to various political, economic, and social expectations on practices. In the case of dairy production, farmers must face the challenge of ensuring quality milk production while improving their practice in an agroecological way by, for example, reducing their use of chemical medicines. These new challenges imply developing new knowledge and skills for farmers in order to create their situated health management, while there is no shared representation of what is or should be an agroecological health management among the agricultural knowledge and innovation system (AKIS). In farms, many agricultural extensionists (veterinarians, but also technical advisors, processors...) individually help farmers in animal health management and in learning new practices. We thus choose to think of such sets of professionals as "advisory systems" built by farmers. We assume that farmers choose health prescriptions according to their own representation of what means a healthy herd and what should be health management. The question remains on how each farmer builds a coherence between the multiple prescriptions they receive from their advisory systems and their own representation. Our objective in this paper is to investigate both the advisory systems and the socio-cognitive representations farmers have of health management and to evaluate to what extent they match or not. We conducted in-depth interviews with dairy cattle farmers in the Massif Central Region (France), chosen for their engagement in agroecological management of animal health. We then carried out a qualitative analysis of the speeches, exploring the relationships between each farmer and his advisors, and how they think and manage health. Using the repertory grid tool, we identified a typology of advisory systems modelling the various organizational forms built by farmers regarding the social and cognitive distribution of advising for their health management. In parallel, we formalized the different ways of thinking and managing animal health farmers endorsed by identifying their aims, conceptions, beliefs, rules and practices related to animal health management. We then discuss the links that we see between the socio-cognitive representations of agroecological health management and the forms of advisory systems. The links we made open avenues to investigate the socio-cognitive development of farmers in their engagement in an agroecological management of animal health, and the conditions in which they may learn to be more autonomous in these agroecological practices. This will also raise some important highlights regarding the potential synergies between advisors, and their training about agroecological animal health management.

ARE ADVISORS THE PRIMARY PROVIDERS OF INNOVATION SUPPORT SERVICES IN FORESTRY AND AGRICULTURE? PRELIMINARY FINDINGS FROM THE PROJECT LIAISON

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A large variety of organisations provides support for cooperative approaches in the field of research and innovation in agriculture, forestry and rural development, and acts as Innovation Support Services (ISS). The findings from ProAkis (2015) show that different types of organisations such as administrative offices, public or semi-public advisory services, rural academies/universities, producer organisations, other NGOs or private consultants engaged in the Agricultural Knowledge and Innovation System (AKIS) can act as ISS. The funding of ISS can be public, private or a mix of both. A first literature review indicates that studies often focus on the larger "enabling environment" and the structure of the Agricultural Knowledge and Innovation Systems (AKIS). Moreover, many authors pay particular attention to the role of public or semi-public advisory organisations. The aim of this paper is to assess the different types of organisations that provide support for interactive innovation, and to analyse the particular role of each type of organisation for interactive innovation projects. Particular attention will be payed to the divers group of organisations that are not part of a (semi)-public advisory organisation. The paper is based on the analysis of more than 200 case studies of publically or privately funded interactive innovation projects within the EU and beyond. The selection of cases took place under the framework of the project LIAISON funding by the EU research and innovation programme Horizon 2020. European and national databases contain several thousands of projects in agriculture, forestry and rural development. We selected projects applying the interactive innovation approach from a) EU programmes (EIP-Agri, Horizon2020, Interreg, and LIFE+); b) nationally/regionally or privately funded projects; and c) informal initiatives or networks in the agri-food, forestry, bioeconomy or nature conservation area. Preliminary results indicate that publically funded IIS play a core role for legal/administrative compliance of projects. Semi-public advisory services take up this role as well, and they are strong in linking farmers with scientists, technicians, entrepreneurs, etc. However, they often exist and offer efficient ISS only for those industries that have a long tradition for a sector or area (e.g. dairy, pork, poultry or club fruit). Niche sectors or industries with little policy engagement often lack the support of a publically funded advisory service but profit more from producer organisations or rural academies/universities when they take up the role of ISS.

THE LOGIC OF INNOVATION: EXPLORING THE ROLE OF INSTITUTIONAL LOGICS IN SHAPING INNOVATION IN AUSTRALIAN AGRICULTURE

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The rationale informing innovation investments in Australian agriculture is one which views innovation as the source of productivity growth. Productivity is a measure of how efficiently inputs are converted to outputs, with the benefits of this efficiency theoretically being passed on to society through higher incomes which in turn deliver a range of societal benefits. Since the early 2000's Australia generally has experienced an extended period of low productivity growth which can be observed in stagnating median household incomes. More specifically, productivity growth in Australian agriculture has been the lowest of almost all OECD countries over the last 2 decades. There are three key drivers of productivity growth which the Australian productivity commission describes as immediate causes, underlying factors and fundamental influences. Current 'innovation investments' typically target immediate causes. Workers in the field of agricultural innovation have been grappling with how best to sustainably address the productivity challenge in the face of an increasingly complex operating environment for nearly a century, with systems approaches having evolved as a direct response to this challenge. The history and traditions of innovation in agriculture and the emergence of systems approaches can be viewed as an expression of different views on how the world works, how knowledge is generated and communicated and how best to solve problems. We equate these 'worldviews' with the 'underlying factors and fundamental influences' which the productivity commission suggest shape productivity performance. In this paper we outline how these 'underlying factors and fundamental influences' may be influencing innovation performance in agriculture and by extension its sluggish productivity growth given the way in which institutions shape all aspects of human agency. A conceptual framework is proposed which has been designed to inform exploration of competing 'institutional logics' in Australian agriculture, with a view to enhancing change mechanisms and refining roles of relevant actors within the Australian AIS.

UNRAVELLING SYSTEM FAILURES WITHIN EUROPEAN MULTI-ACTOR CO-INNOVATION PROJECTS IN AGRICULTURE: A COMPARATIVE ANALYSIS

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European Union (EU) level funding programmes in support of research and innovation in agriculture, such as Horizon 2020 and INTERREG, increasingly require prospective partnerships to bring together different types of actors in order to co-create knowledge and innovation. Although the multi-actor and geographical distribution requirements have created opportunities for new types of actors to participate in these EU-wide multi-actor co-innovation projects, a few pertinent questions point to areas of concern in the way these projects are currently being stimulated by the EU: What are the key challenges met during the project lifecycle? Who is involved in these projects, i.e. do they truly represent a diversity of actors, or rather a distinct set of established, dominant or specialised actors? What is the added value of working with different nationalities, does it allow for broad cross-fertilisation and diffusion of knowledge or is it merely a complex management challenge? How do these projects thus succeed in combining complementary expertise and in finding a balanced relevant representation in terms of Member States, sectors, stakeholders and governance levels? Even though these EU-wide multi-actor projects take up a significant amount of funding and are perceived to play a pertinent role in the transition to a more sustainable agrifood system, in-depth and comparative studies in search of answers to these questions are scarce. Furthermore, it requires a perspective which recognises not only the complexity of this type of co-innovation processes, but also the multi-level reality in which they take place. The Multi-level Innovation System (MINOS) framework enables such an analysis by defining the presence, influence and interdependence of multiple Innovation Systems (IS) in these projects at four levels; the European, the national, the project and the partner level. Applying this framework will allow us to identify different types of multi-level system failures influencing the performance of these projects, i.e. failures which are the result of the interaction and connection between different IS levels and which influence the occurrence and severity of system failures in other IS levels. We aim to analyse and compare the functioning of two European multi-actor projects: a H2020 project on solving drink water pollution from agricultural origin and an INTERREG North West Europe project on the reduction of food losses in the first part of the value chain. INTERREG projects have a narrower geographical focus, are smaller in size and fit in more open calls for proposals than the H2020 projects. Useful lessons on how to improve co-innovation processes in multi-actor projects can be learnt from both policy frameworks. For both practitioners and policy-makers alike, it would be beneficial to improve understanding on how these projects accommodate differences in institutional, infrastructural, cultural and social contexts.

A DEEP DIVE INTO FARMER DISCUSSION GROUPS THROUGH THE LENS OF SOCIAL LEARNING THEORY

Elizabeth Dooley

University of Exeter, Centre for Rural Policy Research, UK

Within the UK agricultural learning landscape, there are different collaborative mechanisms through which farmers can engage and learn from and with their peers. Farmer discussion groups (FDGs) are a longstanding example; they have been found to offer myriad benefits to participants, including economic, social, informational, capacity-building, etc. Building on the lack of understanding as to how learning happens in these contexts from an adult cognitive learning theory perspective though, Bandura's social learning theory was used to assess seven FDGs in the South West of England. The objectives were to determine 1) is social learning occurring within FDGs, and if so, how and why? 2) Are there differences between types of FDGs with regards to promotion of social learning? And 3) should FDG learning processes be tailored differently in order to promote learning outcomes? The conceptual framework was comprised of the theory's critical elements: behaviour modelling, role modelling and critical self-reflexivity. An ethnographic methodology was chosen to gain deep insights into the dynamics, innerworkings and histories of the groups and gather rich empirical findings through participant observation, semi-structured interviews and feedback sessions. The results from a year of attending FDG meetings demonstrated that the elements of behaviour modelling and role modelling are present in all FDGs to varying extents. However, the element of critical self-reflexivity fostered through a proactive commitment to (facilitated) critical discourse was an emergent property amongst FDGs. It was largely absent from those which engage participants in one-way information flow rather than structured two-way knowledge exchange with deep sharing and challenging of tacit assumptions between members. Thus, social learning as understood according to Bandura's theory is not occurring within all FDGs. Collaborative learning processes that aim to promote social learning, therefore, should build capacity and skills, structure engagement and particularly train facilitators to be equipped to foster the critical discourse necessary to promote critical self-reflexivity and metacognitive development amongst participants.

SESSION 1.7. WORKSHOP: INTERACTIVE INNOVATION IN AGRICULTURE, FORESTRY AND RURAL DEVELOPMENT: LEARNING FROM PRACTITIONERS TO IMPROVE PRACTICE – SOME LESSONS FROM THE LIAISON PROJECT

Wednesday 13, 14.00-15.30, Room 124

Chair: Susanne von Münchhausen

In this workshop session we intend to reflect – together with stakeholders from agricultural policy and practice – on the challenges and opportunities of implementing the interactive innovation approach, both generally and within our own project: LIAISON. With this in mind, we will first explore what the interactive innovation approach means (and why it is difficult to provide a general answer to this question), and why it is currently being promoted by the European Commission as a means to enhance and accelerate innovation in agriculture, forestry and rural development. As we shall argue, the interactive innovation approach is basically a procedural ideal that calls for innovation processes not to be confined to science, and for innovative solutions not to be 'imposed' on practitioners after the fact, but to be co-creative, i.e. to involve close collaboration between scientists and practitioners. We will present results of the LIAISON project, which has been generating – through implementation of the interactive innovation approach itself – recommendations for policy and practice on how to improve *their* implementation of the approach. We will also present some interactive tools which we applied in LIAISON and will point to the output for practitioners that we have produced in this interactive way.

On the basis of a short presentation (15 minutes), we intend to initiate a 45-minute discussion with local practitioners from the Alentejo region on several questions, including: when/under which conditions is the interactive innovation approach useful to implement in agriculture and forestry, and what are its limitations? What do practitioners need to (better) implement the interactive innovation approach themselves, and will the tools and recommendations generated by LIAISON and other projects satisfy this need?

The workshop shall thus both serve as a presentation of the LIAISON project and its results (similar to previous project presentations at the IFSA in past years), and provide a forum for a general critical but appraising reflection on the merits and limits of the interactive innovation approach.

Presenters from the LIAISON project and guests (invited stakeholders) will be determined in time before the conference.

DEVELOPMENT OF AGROFORESTRY 'MASTERCLASSES' TO OVERCOME POTENTIAL BARRIERS IN THE FLEMISH CONTEXT

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Agroforestry system (AFs), if well managed, can play a key role in improving resilience to extreme weather events, like floods, droughts and heatwaves. Improvements in resilience can be attributed to several factors: trees in AFs modify microclimatic conditions, increase water retention, and improve resistance to pest and diseases by increasing biodiversity. Also, by diversifying production and thus possible sources of income, AFs also potentially increase the financial stability of the farm. In Flanders, there has been a government incentive scheme in place since 2011 for AFs, but this has not led to the expected increased uptake of AFs by farmers. Borremans et al. (2018) identified a number of barriers and challenges, related to, amongst others, lacking technical knowledge, financial constraints, legal uncertainty, lacking organizational support, and social pressure, that may explain this slow adoption process. The EU LIFE+ project FarmLIFE (2018-2023) aims to overcome some of these challenges, and boost the knowledge and implementation of agroforestry systems in Flanders, The Netherlands, Romania and Spain. One of the main actions in the project is the organization of two consecutive sets of 18 'masterclasses'. These masterclasses are organized for farmers, societal actors, and other interested parties. The aim is to create a supportive learning environment, and are designed to support participants in identifying existing concerns/questions, in addressing these issues, and in defining solution strategies. Content of the masterclasses is intended to be demand-driven. In Flanders, the first set of 18 masterclasses (September 2018 - December 2019) consists of three main 'types' of masterclasses. First, a set of 3 exploratory masterclasses was organized: one for farmers already active/with a clear interest in AFs, one for a wider farming audience, and one directed at 'other actors' (NGO, government, processing, …). The aim of these exploratory masterclasses was twofold: engaging actors for the remaining masterclasses, and identifying possible topics of interest. Based on this, the remaining masterclasses were organized as two parallel sets. A first 'general' set of 9 masterclasses focuses on a range of diverse, quite practical topics, e.g. choosing the right crops/varieties, winter pruning, interesting business models. The second set of 6 masterclasses explores the possibilities of AFs in a specific area in Flanders (Bulskampveld). Learning experiences of masterclass participants will be captured through surveys and a focus group will be organized at the end of the 18 masterclasses, to assess if and how these masterclasses can help overcome existing barriers in Flanders.

PHOTOVOICE: A RESEARCH METHOD FOR FARMER-DRIVEN KNOWLEDGE PRODUCTION

Lisette Tara Phelan[a], Simon Ndungu Nyokabi[b], Amanda Berlan[a]

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This paper argues that there is an imperative for researchers and agriculture sector stakeholders to adopt research methods that place smallholder farmers at the centre of knowledge-creation processes. Although they are custodians of local agricultural and environmental knowledge systems, farmers are often not considered to be part of the 'community of practice' when it comes to enhancing the sustainability of agricultural production systems. Using cocoa farmers in Ghana as a case study, this paper demonstrates that Photovoice is a useful research method for co-generation of knowledge in the context of climate change adaptation and mitigation. Photovoice recognises that farmers are producers of knowledge and is a method that does not look to prescribe what knowledge farmers should capture, or how they should present it. In the context of this case study, Photovoice was used to elicit information on the impact of climate change on cocoa production and farmers' livelihood security. Farmers selected to participate in the study were provided with integrated flash-equipped disposable single-use cameras, brief instructions on how to operate the cameras, and asked to go to their farms to capture and communicate their lived experience of climate change through the medium of photography. Farmers were enthusiastic in sharing why they captured a particular image or a series of related images, during a subsequent feedback session. Recognising that 'a picture is worth a thousand words', many of the farmers entrusted with cameras reported that they had allowed neighbours to also take photographs on their farms. They justified doing so by stating that if the objective was to gain insight into the impact of climate change on cocoa production and farmers' livelihood security, then it should capture the diversity of lived experiences. Moreover, they argued, if the exercise was farmer-led, they should be allowed to adapt the research method to suit their circumstances. Photovoice increases farmers' agency in knowledge-creation processes. As it can provide insight into the impact of climate change on agricultural production and livelihood security in a way that allows farmers to shape their own narrative, Photovoice is a powerful tool for researchers and agricultural stakeholders interested in identifying opportunities for intervention in the arena of climate change adaptation and mitigation.

SESSION 1.9. WORKSHOP: ASSESSING THE AGRICULTURAL KNOWLEDGE AND INNOVATION SYSTEMS (AKIS) PLAN: ESSENTIALS TO ENABLE THE EFFECTIVE INTEGRATION OF ADVISORS WITHIN THE AKIS'S Wednesday 13, 16.00-17.30, Room 007

Chairs: Simona Cristiano and Patrizia Proietti

Innovation is now recognized as a collective process encompassing a variety of actors, knowledge domains, competence and resources. The multidimensional dynamics of innovation are boosted by a complex environment that is moulded by socio-economic dynamics, policy initiatives and global challenges.

This paradigm re-shapes innovation models as well as research and evaluation practices to assess innovation pathways. New analytical frameworks and complexity-aware impact evaluations are needed to grasp the processes and the capacity development which new innovation models aim.

The Agricultural Innovation System (AIS) approach is widely used as a general theoretical framework to detect innovation process and the capacity development. The AIS approach recognizes innovation as a systemic-oriented and co-evolutionary process, combining technological, social, economic, organisational and institutional change, within a continuing interaction process interaction among actors (cyclic learning process).

Over the years, AISs have changed and are increasingly characterized by the entry of new players, new functions and the development of a pluralistic advisory setting.

The EIP-Agri implementation and the strengthening of the systemic and interactive approach to innovation in the common agricultural policy call for taking the stock and improving the agricultural knowledge and innovation systems at the different levels of implementation of the research and innovation policies, to enhance knowledge flows and strengthening roles and function of all the actors, especially advisors, in an inclusive way.

To this aim, the literature has described four main analytical frameworks, which are complementary one to each other for comprehensive assessments of the AISs: the structural-oriented, the functional-oriented, the transformative-oriented and the developmental-oriented one. The purpose of this workshop is to involve policy makers, evaluators and experts to discuss and share insights and experiences aimed at drawing a comprehensive analytical framework to be used for the strategic planning and assessment. This includes the definition of possible methods to analyse the specific context of local agricultural and innovation systems and to carry out the SWOT matrix and the needs assessment for the CAP strategic plan (EC, 2018). The workshop is an opportunity to facilitate the achievement of a systemic and commonly recognized view on the AIS concept and to smooth knowledge flows between all the actors.

ON-FARM DEMONSTRATION AS A POTENTIAL PEER LEARNING AND TACTILE SPACE TO FOSTER SUSTAINABLE AGRICULTURE: A VIDEO STUDY

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Tactile spaces, based on Carolan (2007), as learning environments are assumed to have the potential to raise rate of adoption of innovative agricultural and environmental practices. They influence individuals' attitudes through social embeddedness or interconnections among people, and physical embodiedness or physical negotiations with environmental surroundings. Learning in a tactile space requires that individuals can use all their senses to assimilate their surroundings, and thus to construct and convey not only representational knowledge, but also nonrepresentational knowledge. Such learning environments advocate a more participatory and experiential manner than top-down transfer of technology approaches. Through reflecting upon on-farm demonstrations as potential tactile spaces, we aim to gain clarifying insights in how learning processes and outcomes take place when attendees of on-farm demonstrations interact with the environment the on-farm demonstration offers, including other attendees. To investigate on-farm demonstrations as tactile spaces and places for peer learning, we introduced video analysis as a part of a mixed methods approach. We developed a new video guideline for analysis as a set of targeted video shots related to learning activities, communication initiation and interactive knowledge creation, and to concepts underlying a tactile space, physical embodiedness and social embeddedness. We complemented this video analysis with post demonstration surveys and longitudinal telephone interviews to grasp farmers' reflection and adoption processes. We reflect upon this methodology through the lens of one Belgian on-farm demonstration on mechanical weed control as a potential tactile space. We found that farmers reflected and thought actively about opportunities for their specific situation through attending this OFD. Prices of the demonstrated machines seemed to be the biggest barrier for adoption. Farmers also seemed to think actively about alternatives as for example found in contract workers, working together and sharing a machine, and changing parts of the machines. This study also resulted in suggestions for amelioration of both the video analysis guidelines as the telephone interviews. In addition, we formulated suggestions for further research investigating what triggers reflection and learning: 1) the need for formally organised discussions and 2) organising OFDs which elaborate on physical experiences both in amount of time, deliberate organisation and variation. Overall, our study shows that with some enhancements, this mixed methods approach seems promising to grasp an OFD as a tactile and peer learning space triggering reflection, a first step in deciding on adoption. Additionally, this method assists in defining strengths and weaknesses of an OFD in terms of applied learning activities. We conclude that more research is needed, but we suggest it is beneficial to organise OFDs more as tactile and peer learning spaces to foster sustainable agriculture, using its' potential as a rich learning environment more effectively.

THE ROLE OF FACILITATOR IN FARMERS' DISCUSSION GROUPS

Eleni Zarokosta[a], Alex Koutsouris[a]

[a] Agricultural University of Athens, Greece

The necessity for sustainable recourses management and preservation of farms' competitiveness is widely recognized as a challenge to be met on an ongoing basis. This gave rise to communication models emphasizing on the multi-actor character and the complexity of transforming knowledge into effective practice. In such environments, knowledge seekers and knowledge providers often find themselves in alternative roles, while complexity hinders the dissemination of knowledge. Overcoming these difficulties brings to the fore non-instructional learning activities and knowledge brokers, aiming at facilitating the linkage among the actors involved in the creation, sharing and use of knowledge. This study employs an action research approach to explore the formation of farmers' discussion groups in stables and participants' interconnections and experiential peer-to-peer learning processes. The study was carried out in Karditsa Prefecture, Greece, in the period from September 2015 to January 2018, and focuses on the role of the facilitator and the activities undertaken. Data was collected through individual open interviews with participating farmers and in the discussions during the groups' meetings. Data was analysed on the grounded theory principles. The results indicate that the role of facilitator concerned: a) activities focused on farm programming and management (individual farm level), b) developing interactions and connections among the members of discussion groups (group level), and c) developing interactions and connections within the local AKIS (system level). Among the problems identified were unwillingness for collaboration, difficulty in following common rules and lack of knowledge and experience on the part of facilitator. The study concludes that the role of the facilitator was critical and multifaceted. Success depended on creating conditions conducive to learning and building trusted relationships among the actors involved. Prerequisites for success include the participants' communication capacity, the facilitators' methodological knowledge and readiness to apply it appropriately, and the facilitators' engagement in a reflective learning process that goes beyond academic knowledge.

FACILITATING TRUST FOR COLLABORATION IN SMALLHOLDER VALUECHAINS: A CASE FOR DIGITALIZATION?

Christopher Agyekumhene, Jasper de Vries, Annemarie van Paassen

Wageningen University and Research, The Netherlands

Organizing collaboration between value chain actors is seen as offering a means of addressing existing institutional failures in smallholder contexts. This is because the complex challenges faced often require a harnessing of the capacities of multiple actors through collaboration. Various value chain governance mechanisms (VCGMs) have been explored as approaches to enabling new institutions needed for such collaboration in smallholder value chains. These institutional changes have however often been unsustainable in informal contexts where trust is often the key condition for collaborative relationships. Understanding the functioning of such VCGMs from a trust perspective could therefore provide key insights on the process of facilitating sustainable institutional change for collaborative relations within smallholder value chain contexts. Thus we explore how trust influences institutional change, in the context of VCGMs, for collaborative interdependent relations in smallholder value chains. The study is conducted through a case study of an interdependent smallholder maize farming arrangement in Ghana, West Africa. Our study shows that different forms of trust are present and combine in various ways in relations between interdependent actors within a value chain network. Trust should therefore not be perceived as one dimensional but a spectrum with relational, calculative and institutional trust playing key roles in facilitating collaboration between network actors. It is therefore important to determine the form of trust which dominate at different points in the network so as to better understand the key conditions which need to be supported in order to sustain trust between actors collaborating at that point. In facilitating institutional change in the maize farming context in Ghana, we argue that VCGMs should aim to facilitate supportive conditions for calculative trust in particular in order to build sustainable collaboration in the highly uncertain context. Enabling calculative trust requires information on actor performance as well as quick evidence of failure or emerging problems in the short term. We argue that facilitating this form of trust would likely require and presents a key opportunity for adoption of new forms of digital communication in value chain collaboration in the rural smallholder context.

ADAPTING VITICULTURE TO CLIMATE CHANGE: A PARTICIPATORY SCENARIO DESIGN WITHIN A MEDITERRANEAN CATCHMENT

Naulleau Audrey

INRA, France

In a context of climate change, water management is considered a determinant factor for the agricultural sector, including viticulture. Grape is highly climate-sensitive, regarding both quantitative and qualitative production, making consequently climate change challenging. In France, vineyards are usually rainfed, although irrigation tends to develop, particularly in the Southern regions. However, many concerns remain: sharing the resources between uses and users, water shortage, salinization, etc. Various growing practices contribute to the grapevine adaptation to water shortage under rainfed situations: plant material, planting density, training system, soil management, etc. Adaptation strategies may combine these adaptation levers, through considering current and future water resource, cropping and farming systems.

This paper lays out a methodology aiming at exploring the following hypothesis: "the *combination of growing practices at the plot and farm level, and their spatial distribution in a catchment could give significant leeway to adapt a perennial crop such as grapevine to climate change".* In a typical Mediterranean catchment (Rieutort, 45 km²), a group of stakeholders, involved in viticulture and water management, is mobilized to design and evaluate adaptation strategies, built as alternative spatial distributions of cropping and farming systems. A chain of models is used for producing indicators, measuring the impact of the different adaptation strategies under future climate. The originality of this multidisciplinary approach lies in the coupling of (1) a participatory approach (data collection, scenario design, integrated assessment), and (2) modelling tools allowing multi-scale quantitative assessment (plot, farm, and catchment). The methodological framework is illustrated by the results of the first step: the initial local diagnosis, and a shared conceptual scheme of the studied systems. The two next steps, scenario design and quantitative modelling, will be based on these preliminary results.

THE ROLE OF SCIENCE IN FACILITATING A SUSTAINABILITY TRANSITION OF THE SMALL RUMINANT FARMING SYSTEM ON THE GREEK ISLAND OF SAMOTHRAKI.

Dominik Noll, Marina Fischer-Kowalski

Institute of Social Ecology, University of Natural Resources and Life Sciences (BOKU), Austria

Sedentary extensive small ruminant farming systems are highly important for the preservation of High Nature Value (HNV) farmland. Both the abandonment of grazing, and overgrazing, have led to environmental degradation in many Mediterranean regions. On the Greek island of Samothraki, decades of overgrazing by sheep and goats have caused severe degradation of local ecosystems. The present study highlights the role of socio-ecological research in facilitating a sustainability transition of the small ruminant farming system (SRFS) on the island. By utilizing a mixed methods approach based on the conceptual framework of social metabolism, we show how long-term transdisciplinary research can achieve valuable scientific results and at the same time initiate a practical outcome. Sociometabolic results indicate clearly a regime change of the SRFS after 2002, and during the time period of our research. Between 1929 and 2016 the livestock and land-use system of Samothraki transformed from a diverse system towards a simplified system, solely used for small ruminant production. Total livestock units increased from 2,200 in 1929 to 7,850 in 2002, declining to 5,100 thereafter. The metabolic analysis conducted for the years 1993-2016 shows that the feed demand of small ruminants exceeded local available grazing resources at least for a decade. Monetary data shows that local small ruminant farmers generate 50% of their revenue through subsidies and have an income of 5,000€ per year per farmer on average. We discuss the role of science in the transdisciplinary research approach that shifts from mainly analytical, with the aim of understanding current problems and challenges, towards participatory with the aim of creating a space for knowledge co-production and preparing for change.

INVOLVING STAKEHOLDERS IN THE DEFINITION OF PATHWAYS FOR MORE SUSTAINABLE BEEF FARMING SYSTEMS

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Using a multi-actors approach, the SustainBeef project aims to identify pathways to reduce feed/food competition in beef production systems in several regions of Europe. In this paper, we describe the first step of this multi-actor approach, i.e. using the technique of focus group as a mean to identify relevant innovations to move from beef production systems relying on feedstuffs that could also be directly used as food to potentially more sustainable systems. In total, 8 focus groups were conducted (in Belgium, France and Italy), involving the participation of almost 70 stakeholders, half of whom were farmers. Results presented below are partial, the analysis is still ongoing. The added value of focus groups, compared to individual interviews, lies in the interactions. Faced with others, the actors are led to make their opinions more explicit, which provides the necessary nuance that allows the researcher to refine his/her understanding of the opinions expressed. In our project, the discussions showed how the decrease of feed/food competition cannot be thought of as a simple substitution of one practice by another (e.g. replacing grain-based concentrates with agro-industrial by-products inedible by human), but questions the way cattle farming is organized as a whole. In this sense, focus groups allow to highlight socio-technical lock-in of the current beef production systems. Thus, differences of opinion emerged within and between groups regarding grass fattening, for example, depending on whether the participants were part of conventional or short food supply chain. The former pointed out the barrier of production standards, which currently make grass fattening impossible. The latter were more convinced by grass fattening. However, although it is not an exclusion criterion, consumer acceptance of this kind of meat (expected to be different) remains a source of uncertainty. Divergences of opinion also appeared concerning the use of agro-industrial by-products. On the one hand, value chain actors, farm advisors and conventional farmers selected some of them as relevant innovations, even though they pointed out some barriers (such as the supply regularity). On the other hand, organic farmers did not consider any by-products as a relevant innovation. Moreover, some of them totally excluded the use of this kind of resources, as it is irreconcilable with the search of feed autonomy. At the reflective level, the device used also had an impact on the production of knowledge: scientists agreed to discuss the objectives of the research and to integrate non-academic knowledge.

HOW TO FACE THE CHALLENGE OF ANALYSING THE RESULTS OF ON FARM EXPERIMENT TO SUPPORT PARTICIPATORY RESEARCH SCHEMES?

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TRANSAE (Transition Towards Agroecology) project (INTERREG V France, Flandre Wallonie Program) aims to support the transition of front runner farmers testing, adopting and sharing more agro-ecological practices. To do so, we want to support them in the co-definition of their innovation, in their implementation, on farm, and in the characterization of the connected performances to be able to transfer them under a large diversity of soils and climate conditions. As stated by Piepho et al. (2011), on-farm experiments (OFE) have a long-standing tradition in agricultural research concerned with the co-conception and adoption of new technology by farmers, in the context of low inputs farming systems. Nevertheless, OFE require larger plots than on-station trials due to technical constraints imposed by large farm machinery. Finally, the number of treatments is typically quite small, mostly covering the farmers' practice as a control and a few new treatments and, overall, can be, due to logistical constraints, unreplicated. In such context, how can we conciliate expectations of agricultural science, based on systematic observation, measurement and experiments, rigorous replicable methods, large data sets and analysis, and expectations of farmers expecting outputs relevant to different production and management/decision contexts? To answer this question, this contribution aims to explore methods for analysing unreplicated experiments in order to support the feasibility of OFE involving a large network of farmers testing a diversity of innovative practices. Three levels of analysis will be proposed. (1) In order to highlight, based on a shared list of indicators, the performances of plots with or without (control) agroecological practices, and their evolution during the three years of differentiated practices implementation, a principal component analysis (PCA) will be performed across the cropping farms of the different regions. Practices descriptors projection on the PCA axis will allow connecting practices and performances. (2) Within the clusters of farms mobilising similar innovations, the impact of these practices will be tested through classical variance analysis. Innovations will be compared to control performances while farms will be considered as bloc factor. (3) Finally, within each farm, the performances of innovative practices will be compared to the control ones, on the basis of before-after-control-impact designs. This proposal will illustrate the mobilisation of these methodologies on a first dataset.

A LANDSCAPE SCALE EXPERIMENT TO TEST PRACTICAL MEASURES TO DELIVER MULTIPLE AGRICULTURAL AND ENVIRONMENTAL BENEFITS

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As elsewhere, there is increasing concern in the UK about the challenges of climate change and biodiversity loss, including increased flood risk and deteriorating water quality associated with runoff and erosion during storm events, and also deteriorating water quality associated with reduced dilution of pollutants during periods of drought. These are also associated with impoverished aquatic biodiversity. A combination of climate change, increased machinery size and simplified cropping systems and accompanying soil compaction, water-logging and loss of organic matter is associated with reduced agricultural production. We report on the first six years of a 3,000 ha BACI (Before, After, Control, Impact) experiment comprising three agricultural headwaters (one control and two 'treatment') in central England. The project aims to test the efficacy of a range of measures to 1.) increase landscape scale aquatic biodiversity, 2.) improve water quality, and 3.) reduce downstream flood risk, while maintaining or improving agricultural productivity and profitability. The project is based on a rigorous experimental design in a practical farm business setting. Introduction of small clean water ponds demonstrated rapidly, and for the first time, the potential of such measures to increase landscape scale aquatic biodiversity. Hydrological modelling suggests that the introduction of permeable timber dams in streams and ditches can potentially reduce downstream flood risk by 20%. This is currently being tested. Measures adopted to enhance these objectives, and meet the remaining objectives, require changes to the management of agricultural soils at the landscape scale, involving a range of complex interacting physical, biological, social, cultural, economic and political factors. Poorly functioning soils result in erosion and sedimentation of watercourses, reducing biodiversity and increasing flood risk, while also increasing nutrient and pesticide transport to water. Such soils also increase weed populations and reduce crop rooting capacity, nutrient cycling and uptake by crops. Participating farmers identified compaction and loss of organic matter as key factors limiting crop performance and profitability, and through the linked EU SoilCare project co-designed two replicated plot experiments to explore options to address these constraints. A workshop enabled farmers to consider the broader economic, social and political constraints on changing soil management. Together, our findings demonstrate that some simple measures can address some objectives for delivery of societal benefits, but also highlight the economic and political constraints that characterize the trade-offs between public and private goods and services in a lowland agricultural landscape.

REDUCING PESTICIDE USE IN VINEYARDS. EVIDENCE FROM THE ANALYSIS OF THE FRENCH DEPHY-NETWORK

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High quantities of pesticide are applied on vineyard. Transition towards low pesticide farming systems is a key issue to improve viticulture sustainability. Farmers have to gradually change their practices to engage in this transition. A large number of agroecological practices are already existing but farmers can encounter obstacles during their implementation. This work aims at analysing the pesticide use evolution during transition towards low pesticide farming systems and identify some management options mobilized by winegrowers. To understand the diversity of pathways taken towards agroecological transition, we characterized different types of pesticide use trajectories. We analysed the data from 244 cropping systems engaged in a network of French demonstration farms, DEPHY-Farm network, created to promote and assess the implementation of practices to reduce the pesticide use. The network provides data over a 10-year period across 12 winegrowing regions. To assess pesticide use, we used the Treatment Frequency Index (TFI) and focused on TFI trajectories. We described the TFI trajectory of each farm using six indicators: the initial TFI and final TFI, the intensity of the TFI decrease, two indicators of potential rupture and the slope. A Principal Component Analysis followed by an Ascendant Hierarchical Clustering were performed to build a typology of pesticide use trajectories. In addition, we performed a survey to identify, for each type of pesticide use trajectories, the levers implemented by winegrowers. Our results showed that cropping systems experienced a pesticide reduction of 33% in average related to the decrease of fungicide use. Three types of pesticide use trajectories were identified: the first type represents farms with a high initial TFI and an important reduction of TFI. The second type corresponds to farms with a low TFI when entering the network and that reduced it progressively. The last type represents farms with low initial TFI and without significant pesticide use evolution. Depending on the trajectory type, the intensity and the type of changes in fungicides applications and biocontrol used were different. From the surveys, 76 levers implemented by the winegrowers were recorded. The main levers implemented are related to the dose reduction, choice of the product, stop of herbicides and optimisation of spraying. The changes were characterized according to the ESR framework. Cluster 2 Farm mostly redesigned their cropping system while Cluster 3 Farms mostly implemented levers based on a gain on Efficiency. The context of the farm impacted changes in practices.

ASSESSMENT OF THE RESILIENCE OF FARMING SYSTEMS IN THE SAÏSS PLAIN, MOROCCO

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The Mediterranean region is expected to become a hotspot for the impacts of climate change, with high vulnerability to global change. The major challenge is therefore making agricultural food production systems resilient to climate and market shocks. Resilience can be defined as the capacity of a system to buffer shocks while maintaining its structure and function. Focusing on the farm scale, several studies used modelling tools to analyse the resilience of farming systems, however with little involvement of stakeholders when designing scenarios and in resilience impact assessments. Accordingly, a participatory approach was set up in the Saïs plain in Morocco with the objectives of (1) designing, with stakeholders, the possible future state of different typical farm types under major drivers of change, and (2) qualitatively assessing their resilience. This approach combined different steps: (1) characterizing the structure and performance of current farm types using literature and stakeholders' and farmers' interviews, (2) defining and selecting the main regional and specific drivers of change per farm type, (3) building cognitive maps for current and future state of each farm type according to drivers, (4) characterizing performances of future farm types, and (5) evaluating their resilience. Steps 2, 3 and 4 were achieved with a strong involvement of stakeholders via collective meetings. The indicators of the resilience assessment were defined based on literature, expert interviews and collective meetings with stakeholders. These indicators expressed different types of capitals (land, workforce, financial), public policies, market and water access. Four representative farm types were selected: highly irrigated predominantly vegetable farms (F1), monocropping rainfed cereals farms (F2), partially irrigated cereal-legume farms (F3) and mostly irrigated fruit-tree-vegetables farms (F4). Climate change was identified as a main driver of change for F2 and F3 whereas access to irrigation water was identified for F1 and F4. According to these expected changes, stakeholders designed adaptation strategies based on the promotion of more diversified systems. Based on the resilience indicators, stakeholders identified F4 and F2 as the most and the least resilient farms, respectively. Overall, this qualitative approach provided relatively different results than previous modelling studies for the same area, thus highlighting the important role of local stakeholders in promoting adaptation strategies against global change.

TRANSDISCIPLINARY INNOVATION PROCESSES TOWARDS SUSTAINABLE LAND MANAGEMENT

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Leibniz Centre for Agricultural Landscape Research, Germany

Many sustainability problems are connected to land use and there is a high sense of urgency for socio-technological change and transformation of current land use practices. In this context, many scholars have emphasised the vital role of designing and steering efficient innovation processes. However, envisaged sustainability innovations differ from other types of innovations. They serve long-term societal goals but mostly lack direct marketing or commercialisation potential. Since management of land is highly regulated in many countries of the world, land management innovations have to take regulation compliance into account. It is deeply embedded into socio-ecological systems and thus frequently contradicts with social practices, regulations and existing infrastructure. As it is still weakly understood how transformation and socio-technological change in the specific field of sustainable land use and management can be effectively governed and supported, the aim of this talk is to contribute to this knowledge gap. We will present findings from a comparative case study on transdisciplinary innovation research projects from Germany that sought for solutions towards more sustainable land management (SLM) practices. After the introduction of a theoretical framework that supports capturing the specific nature of innovations for sustainable land management, the presentation examines i) the characterisation, leverage points and socio-technical imaginations of innovations for SLM, ii) approaches to manage the innovation processes, and iii) interactions with persisting rules, structures and networks. Results show that innovations for SLM start with diverse problem framings, emerge from distinct action fields and reflect various socio-technical imaginaries that predetermine trajectories of transition. Furthermore, there is a broad variety of innovation types focussing on different leverage points. All projects applied multi-actor approaches to facilitate reflexive processes of learning and cognitive reframing, optimising the innovation, and interacting with persisting structures and communities.

THE CUMULATIVE TRADITION OF DECISION SUPPORT SYSTEMS RESEARCH: NEW PERSPECTIVES ON SUCCESS

Julie Ingram

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The opportunities and challenges of Decision Support Systems (DSS)[1] in connecting science and practice are well rehearsed in the academic literature. The focus has mainly been on issues of poor uptake by practitioners. These have been problematized and theorised from different perspectives, largely in relation to the epistemological gap between the hard and soft approaches respectively of science and practice. As Nelson et al. (2000) point out, "while early expectations of computerised decision support systems (DSS) as the connecting vehicle between research and practice have gone mostly unrealised, some lessons have emerged from the attempts". Such lessons have been widely reported in Australia in particular, where the evolutionary process of crop model based DSS in agriculture has been has been extensively charted and analysed, especially in relation to supporting decision-making in the context of climate variability. Overall this literature can be characterised as reflective and involves "learning as we go"; with researchers suggesting the "need to pause and think about current levels of R&D investment in IT"; and the need for "extracting learnings from experiences" and interpreting "this rich set of experiences, in ways that are meaningful for future action". As part of this reflection, arguably a cumulative tradition has emerged as DSS development moves towards a level of maturity on the back of increasingly rigorous empirical work, reflection and theorisation. Notably a body of work drawing on FSR thinking highlighted the significance of user involvement in DSS development and the role of DSS in supporting learning rather than decisions made a contribution to redefining DSS as broader initiatives of knowledge transfer and organisation. Despite these developments, the concept of DSS success itself has not been adequately defined or theorised. There is still a tendency to focus on DSS design, short term performance and uptake, with less attention paid to questioning the wider impacts and the benefits of building a cumulative tradition. This paper argues that traditional assessment of DSS 'success' need to be complemented by an analytical framework that recognises systems of reflection, learning interactions and their institutional context. The paper aims to explore these issues in the context of the Australian northern grain growing area, through a review of the DSS literature and expert consultation, and in doing this advance theoretical development of the DSS research domain.

[1] DSS (often developed into DS Tools) are computer-aided management systems which are typically based on scientific models developed with the purpose of enhancing farmer decision-making.

MANAGEMENT PRACTICES OF RESIDUAL BIOMASSES: A METABOLIC NETWORKS PERSPECTIVE

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The management of residual biomasses (e.g. livestock effluents, green, human and industrial waste, and crop residues) is confronted to ongoing challenges such as climate changes or sanitary crises. Large scale institutions like markets, state and EU laws are increasingly challenged as inefficiently regulating biomass flows. The local scale is seen as a solution to "take back control". Local scale representations of metabolism are developed so to engage in action. Scale-based representations of metabolism often prejudge "what acts" in the metabolism, and struggle to identify actual agency of participating agents in biomass flows, as metabolic processes are regularly multi or a-scalar. The risk is to find the same powerlessness at the local level as one encountered on a global scale. We propose instead an interdependence-based and non-scalar tool: the metabolic network, which helps identify what acts on farmers' practices in their management of residual biomass. We test two hypothesis to understand the circulation and use of residual biomass, the role of: (1) the agency of institutional stakeholders; or (2) moral systems (based on the Economies of Worth by Boltanski and Thevenot). This is illustrated through a case study in Vallée de la Drôme (France) known as the "organic valley". Semi-structured interviews with farmers and local stakeholders in the agricultural sector were performed. Respondents were invited to describe and justify their residual biomass management practices (e.g. effluent management, fertilization, composting), both quantitatively and qualitatively. A project of collective compost-plant was also analysed. Our results reveal interdependencies between actors, within different networks. Some flows, as crop residues and industrial wastes, are mostly beyond the control of local stakeholders while they are strongly associated with the management of municipal green waste and compost flows. Moral systems play a major role. The market and industrial moral systems are for example central in standardized fertilizer flows. We show that some parts of the metabolic network present stable network of biomasses, local stakeholders and moral systems. In other parts of the network, instability concerns moral systems and local stakeholders. We discuss the interest of a non-scalar and interdependence-based approach of metabolism in terms of action: collectives with which researchers can set up a co-construction are identified, without prejudging potential actors. This approach makes it possible to identify non-institutional actors who would not have been identified by a scalar approach (e.g. those involved in moral systems). We discuss how these representations highlight some incompatible actions, and to what extent it drives the researcher to position himself as an actor, and to take a political stance.

SESSION 2.4. WORKSHOP: FARMER-LED RESEARCH AND INNOVATION: UNDERSTANDING THE PROCESSES AT THE FARMER AND SCIENTIST INTERFACE?

Wednesday 13, 16.00-17.30, Room 124

Chairs: Lisa van Dijk and Julie Ingram

Farmer-led research and innovation initiatives have had an increasing presence in the UK AKIS since the privatisation of advisory services, responding to a shift towards more farmer-centred thinking and opportunities for support. In these initiatives, new (and often more complex) relationships emerged between the scientists and farmers based on experimental learning and the co-production of knowledge moving away from the more instrumental researcher-farmer relationship to a more collaborative one working to jointly develop local integrated innovations for complex problems. In these processes the role of both farmers and scientist has changed. Farmers are valued for conducting their own experiments and are now partners in co-innovation processes, whilst scientists support the innovation process, often with an enabling or facilitating role. Farmers, however, are not a homogeneous group and their willingness, interest (motivation) and time to engage in these processes varies widely. And it requires skills the scientists not necessarily have gained through their academic careers and challenges are faced within their research institutes as they are increasingly required to demonstrate tangible and recordable outputs and clear unequivocal impact.

This workshop aims to bring together the expertise and experience of conference participants to consider the following questions:

- As a co-learning process - what learning is taking place and who derives benefits?
- How can we create new pathways to improve quantitative and qualitative participation of both farmers and scientists in these co-innovation processes?
- What are the specific skills (or capacity) required and motivation of farmers and scientists to engage effectively in these co-innovation processes?
- How can we develop and strengthen incentives systems to motivate more scientists to engage in these processes?

The workshop will start with a brief presentation by Tom MacMillan to introduce the workshop topic and set the scene: Tom MacMillan is the former Director of Innovation for the Soil Association, where he founded the Innovative Farmers network, which supports practical ‘field labs’ by farmers. This is followed by a World Café style interactive session to discuss the questions, share knowledge and harvest the experiences of the workshop participants. At the end of the workshop, the discussion will be consolidated by summarising in plenary. The outcome of the workshop will be written up in a short working paper to spark further discussion and action as well as to inform training of scientists by various organisations.

WHAT PROSPECTS FOR WORK IN AGRICULTURE IN THE WORLD?

Benoît Dedieu

INRAE, France

1.3 billion people work in agriculture (family farmers, salaried workers), i.e., 27% of the world's active population (2018). The number of agricultural workers is expected to remain stable in the coming years. Research on work in agriculture remains rather disciplinary (economics dealing with labour markets, ergonomics with occupational health, sociologists with family farming and rural development or with the emergence of new figures of the profession). Given these conditions, how can we produce a consolidated vision of the future of work in agriculture on a global scale? This was the objective of the 2nd International Symposium on Work in Agriculture entitled: 'Thinking the Future of Work in Agriculture' (29 March – 1 April, 2021). The dynamics of development of agriculture in the North (OECD) contrast with those in the Global South and thus raise different issues. Is an "agriculture without farmers" the future in the North (with salaried people in very big estates) considering the regular decrease of the number of farms and of active population? In the South, decent work (from the ILO definition) is still a target point for a significate part of the agricultural workforce. Beyond these deep differences, some issues appear to be transversal. The agroecological transition is everywhere a change in the farming style and a change in work organization, and in working conditions that have to be studied for different categories of workers (man, women, young, wage-earners). The digital revolution will certainly support the smart industrial agriculture but may be useful in agroecological – family situations. Migration is also a major phenomenon, from rural areas to cities, from poor countries to rich ones, often leading to precarious and hard-working jobs. What are the perspectives for a research agenda? First, decent and attractive employment is one key point for the future. Job satisfaction indicators (including self-fulfilment) are to be deepen notably to foster youth (in the South) and new incomers (OECD) interest for farming. Second, there is a need to considering the co-evolution of structural and social drivers (enlargement of farms, societal recognition of farmers…), on farming's new set of specifications (ecologization of practices) and on digital opportunities. Thirdly, agri-chains and territorial approaches of work should be enhanced.

SESSION 3.2. BOOK PRESENTATION: GOVERNANCE FOR MEDITERRANEAN SILVOPASTORAL SYSTEMS: LESSONS FROM THE IBERIAN DEHESAS AND MONTADOS (ROUTLEDGE 2021)

Monday 11, 16.00-17.30, Room 124

Chairs: Teresa Pinto-Correia, Maria Helena Guimarães, Gerardo Moreno, Rufino Acosta Naranjo

This book is about the resilience of silvo-pastoral systems, now and in the future. As such, it is about people. The goal is to fill the gap in the knowledge on silvo-pastoral systems and their changing trends, by adding the human dimension, with enough detail to draw inferences about the new governance solutions that are needed to address the multiple challenges faced by silvo-pastoral systems. As such, the book provides knowledge applicable to current and future silvo-pastoral territories in other regions across the world.

The volume is divided into three sections: people and institutions, the institutional framework, and governance models. In this session we will walk through each section and provide a closer look to one of the chapters and discuss the value and utility of this work. We hope the book will be valuable to university and research institute libraries, academics, policy officials, and stakeholder groups, such as NGOs and sectoral organizations, who wish to better understand the relevance of the human factor and use this knowledge to find sustainable solutions.

Our goals are to gather and cross contributions that can be a central reading for postgraduate students enrolled in rural planning, landscape management and governance, agronomy and forestry, as well as geography and socio-ecology programmes, that have a focus on sustainable land use management and supporting mixed farming systems.

Teresa Pinto-Correia and Rufino Naranjo will be responsible for welcoming participants, after which Maria Helena Guimarães will provide the rational and details of the book, as well as address questions and clarifications. Jørgen Primdahl will moderate the discussion. Flyers will be available to purchase the book with 20% discount.

BUILDING FARM SYSTEM RESILIENCE IN CANTON DE VAUD, SWITZERLAND

Dominique Barjolle, Ulysse Le Goff, Johan Six

ETH Zurich, Agroecosystem Group, Switzerland

In the context of climate change, enhancing the resilience of farms is becoming increasingly important to ensure rural development and food quality for all. Resilience is defined as the capacity of a system to respond and re-organise itself when facing both foreseeable disturbances and unexpected events. Hence, resilient farm systems are expected to develop and reinforce their capacity to adapt to climate change, as well as to other shocks. This research aims at both assessing resilience at a farm system level and building resilience through farms adaptive strategies in the particular case of the Canton de Vaud in Switzerland. In order to carry a representative study on the Canton, we characterised the diversity of the farms and selected a representative sample of 130 farms among all regions. K-means stratified sampling method enabled to group the 3600 farms of the Canton in twenty-two strata corresponding to distinctively different farming systems. Within each strata, we randomly selected a representative number of farms to assess their climate resilience. The SHARP (Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists), a tool designed by FAO, was used to realize the resilience assessments during ten workshops with 100 farmers. We could rely on a SHARP version previously adapted to a western European context. Results show which aspects (among the 52 aspects that describe a farm system in the SHARP tool) are required and leaves place for innovations to build its resilience to climate change. These specific aspects have been discussed during participatory workshops. The main obstacles slowing down the path to more agro-ecological and resilient farm systems could be identified and discussed, as well as innovations that could be implemented to enhance resilience. Agroforestry appears to the most promising path towards long-term adaptation to climate change in this particular region. In fact, strong imbrications between forest, pastures and cropping exist in the Jura (“pâturages boisés”). In the plains, hedges and groves as well as high-stem fruit trees were until the 60’s everywhere in the landscape. Revival and renewal of such combination between trees, pastures and crops should be strongly supported in the future, and a participatory research programme is in the starting blocks.

ASSESSMENT OF VULNERABILITY TO CLIMATE CHANGE OF MAIZE FARMING SYSTEMS: DESIGNING AN INDICATOR SET BASED ON FARMERS' PERCEPTIONS AND KNOWLEDGE

Marine Albert, Jacques-Eric Bergez, Stéphane Couture

INRAE, France

Maize growers in Southwestern France are facing increasing climatic variability, creating negative impacts on their farming systems (e.g soil erosion, water stress). Understanding vulnerability of these farming systems is an essential step in order to enhance new adapted farming systems toward climate change. Although vulnerability is a central concept in climate change studies, and has already been discussed a lot in the literature, there is scarce knowledge on its operationalization to assess farming systems. This research aims at contributing to this issue by identifying determinants of vulnerability and create a generic multi-criteria methodology to assess vulnerability at farm level. Surveys with maize growers are central in our work, since we built a set of indicators based on farmers' perceptions and knowledge. Original methods are used in order to elicit determinants of vulnerability, such as lottery games, role plays, and scenario. At this stage of the thesis, results revealed (i) the important influence of cognitive and psychological factors of the farmer on vulnerability of the farming system, and (ii) a significative heterogeneity among farmers in their evaluation of adaptation strategies for reducing vulnerability. We plan to confront the set of indicators based on farmers to literature and experts in order to develop and validate the set of indicators as well as its operational framework, from a scientific point of view. To this end we will use participatory methods through focus groups involving both researchers, agronomists and technical advisors. Finally, we will test the revised set of indicators with maize growers to make sure of its suitability and good handling. Results of this research will give knowledge and tools for advisors and policy-makers to adapt their support strategies for maize growers, in a context of climate change.

CAN WE PUSH AGROECOLOGY A STEP FURTHER?

Sara Burbi[a], Ulrich Schmutz[a], Stéphane Bellon[b]

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There have been many studies recently advocating for the adoption of more agroecological farming practices related to climate change. In this session we want to go beyond the initial concepts of agroecology and address specific needs such as reduced dependence on external inputs. We feel, while agroecology can be well received as a theoretical concept by practitioners in a wide range of contexts, there is a need to delve deeper into its practical and technological aspects to implementing it further. For example, farming system solutions for Mediterranean horticulture with zero pesticides inputs (also including zero copper or mineral oils - still allowed in certified organic farming) can be a challenge to implement and may need innovative approaches. Another example can be silvopastoral systems, the production of tree fodder with anti-parasitic and anti-microbial effects, eliminating synthetic drugs use in animal husbandry. Similarly, the use of plastics is still wide-spread and phasing out other climate change relevant inputs like peat has still not taken off, especially in horticulture. Food storage and processing can also be an asset in alleviating impacts of climate change. Moreover, technological pathways exemplifying how changed agroecological food and farming systems can contribute to climate-friendly designs are welcome. These may include a reduction in use of external inputs during the production phase, dietary changes and pasture management strategies to reduce emissions from livestock, storage, treatment and application technologies to mitigate emissions from manure. The potential consequences of changed practices and inputs on the adaptation and mitigation of climate change are important to assess, together with their integration into short food supply chains and changed diets. Can we design farming systems where plastic, peat, mineral oils, antimicrobial, antiparasitic or other contentious inputs are not necessary? Agroecology can provide practical solutions to redesign sustainable food and farming systems facing climate change. Can we push agroecology a step further?

COMBINED FARM SUSTAINABILITY ASSESSMENTS: HOW ARE AGRO-ECOLOGICAL PRACTICES CAPTURED BY DIFFERENT ASSESSMENT TOOLS?

Jan Landert[a], Catherine Pfeifer[a], Johannes Carolus[b], Gerald Schwarz[b], Fabrizio Albanito[c], Adrian Muller[a, d], Pete Smith[c], Jürn Sanders[b], Christian Schader[a] , Francesco Vanni[e], Jaroslav Prazan[f]

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This study explores practice-validated strategies for agro-ecological transitions in 15 case studies across Europe. Each reflects a certain point of transition towards agro-ecological farming systems (AEFS). We characterized the status quo of these systems by applying three decision support tools (DST). They provide information on the environmental, economic and social performance of current AEFS and allow to capture agro-ecological practices. The tools applied were COMPAS, an economic performance assessment tool, Cool Farm Tool (CFT), a greenhouse gas inventory, water footprint and biodiversity assessment tool, and SMART, a multidimensional sustainability tool. Results show that farms are highly diverse across Europe, but overall agro-ecological farms tend to enhance biodiversity and water quality, for instance due to a reduced use of chemical-synthetic pesticides and mineral fertiliser. The economic performance of agro-ecological farming however is heterogeneous and no clear patterns are visible. Furthermore, aligning three tools from different disciplines provided insights for the future development and joint application of the tools. A central aspect is that the alignment requires harmonisation, simplifications and assumptions with regard to the input data of the tools.

HORTICULTURAL AGROFORESTRY: THE CHALLENGE OF DIVERSIFICATION SERVICES

Marc Tchamitchian, Dayaleth Alfonzo-López, Raphaël Paut, Rodolphe Sabatier, Romain Roche

INRA, ECODEVELOPPEMENT, France

Agriculture specialization and intensification has led to a biodiversity loss in while this biodiversity fulfils several services in agroecosystems, among which natural regulations and pest control. Cropping system diversification is a promising answer to these challenges, in the frame of agroecological transitions of agriculture. In this context, agroforestry combines diversification with other potential services, densification of the production, synergies between crops, enhancing natural regulations, and seems a very promising opportunity. Following this line, horticultural agroforestry, mixing fruit trees and vegetable crops on the same plot is gaining momentum as a strategy to address both the consumer demand and these ecological goals. These systems embed a high biological diversity, through the association of several crops at the same on time on the same plot, and through the large number of crops in rotation along time. However, recent works points out that some of those services are not so favourable as hypothesized. For example, a positive link between the increase of the number of crops and the number of different enemies has been shown, with consequences on the damages to the crops, also increasing with the number of different crops. On the contrary, production variability has been shown to decrease while diversification increases, at the expanse of the total productivity, unless synergies between crops are exploited (associating crops with Land Equivalent Ratios larger than one). It appears therefore that the diversification has contrasted effects, making the evaluation of its benefits a real challenge. In this presentation we will propose a framework to guide the evaluation of the balance between these different services, in relation to the structure and the composition of the horticultural agroforestry system at hand. This framework would therefore allow to support the design of such systems, in terms of complexity and in terms of organization.

RETRO-INNOVATING AROUND ACORN PRODUCTION IN PORTUGAL

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Acorns represent an important production of Portuguese forest. Although being nowadays used mainly as livestock feed, acorns were used directly as part of the human diet for centuries. Its consumption decreased due to the progressive improvement in living conditions of the rural population and the influence of the urban culture in the countryside. In recent years, the use of acorns has been re-introduced as niche activities, by some agri-food companies, interested in diversify the sources of income from this system. The number of companies exploring the acorn as well as the number of acorn-based products were also been growing, initially more inspired by recipes used in the past and, more recently, with a higher degree of technology incorporation. We can consider those initiatives as retro-innovation, and one of the challenges of this renewal of the acorn use would be to bring new added value into the Montado system. If the abandonment of acorns as food for humans was part of the change in food habits in a phase of intense development in life conditions, the present and future conditions related with climatic change, the need for decarbonizing the economy and to overcome the nutritional impoverishment of our menus can be reasons to support a retro-innovation with the goal of a renewed use of this food item.

DECOLONIZING NATURE? WORLDVIEWS OF AGROECOLOGICAL FARMERS IN GERMANY, AND IMPLICATIONS FOR RECONNECTION WITH SOCIETY

Stephanie Domptail, Jennifer Hirsch, Ernst-August Nuppenau

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Agroecological approaches aim for farmers to entertain fundamentally different relationships between agriculture and the natural/social environment. Such a reconnection with the environment requires that farmers take actions based on an alternative worldview. Agroecological movements claim that their practices are based on a holistic worldview of nature. In Western Europe, farmers are embedded in a Western culture. This culture characterized by a worldview where man and nature are separated and opposed (dichotomies), individualism is highly valued (e.g. high value of private ownership), capitalism rules exchanges and where the end production of food, rather than the process of food production, is central to food systems (the productionist paradigm). How in this context do agroecological farmers develop a new worldview for them, their practices and their existence in the territory and in society? We currently have little cultural information about present-day agroecological farmers in Western Europe. Thus, the contribution explores the worldview of agroecological farmers in Germany in order to identify how the connection with nature is conceptualized and whether new connections to people are implied. The Human-Nature connections are interpreted making use of the Gaia theory, the concept of decolonization of nature, in a context of environmental philosophy of the Anthropocene. More specifically, we ask three questions:

- How does the worldview of agroecological farmers in Germany make use of a decolonized perspective in order to reconstruct their relations to nature?
- Do agroecological farmers share a same worldview that underlies their decision to employ agroecological practices?
- How does the worldview of agroecology farmers place them in the territory in relation to their social environment, in order to address societal challenges such as climate change and the capitalist structure?

The study relies on in-depth interviews conducted per skype with 7 members (men, women, younger and older) of one agroecological farmer alliance in Germany. The collected narratives are analyzed using a reconstructive qualitative method to reconstruct key characteristics of farmers' worldviews, in particular their relation to nature. Second, we identify which place farmers perceive for themselves in their social environment with regard to important societal challenges such as climate change (e.g. Nature-lovers? Escapists? Revolutionaries? World-savers?). Investigating the ontological basis for the practice of agroecology in the Western European context can reveal fundaments to foster the agroecological transition and insights to the role agroecological farmers want to play in the wider food system.

CONCEPTION OF LOCAL CARBON MARKETS CONNECTING FARMERS AND ENTREPRISES: SOCIO-ECONOMIC OUTLINES OF INNOVATIVE DEVICES

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As environmental market based policy develops, voluntary carbon markets are emerging as a potential way of valorisation of carbon storage services by farmers. In the West of France, one of the important levers of carbon storage is the maintenance of hedges. But, despite previous public and local policies to maintain the hedgerow, the linear of hedges decreases. Our project therefore examines the conditions for the development of local carbon markets as a new way to enhance hedges maintenance and to mitigate climate change. The carbon markets are singular devices in agriculture, especially because they are based on a process of securitisation, in a political landscape dominated by a contractual logic (AEM); and such markets are not established in France. The commitment of companies and farmers remains uncertain. It necessitates to succeed in building connections between selling farmers and buying companies. Our research aims to specify the outlines of such devices. For this, we conducted in 2018 a survey of 57 actors in 3 territories of Western France (20 companies and 37 farmers) to measure and explain their preferences. The results of this survey are currently consolidated with a survey of elected representatives and local government agents, with 3 focus groups mobilizing businesses and farmers, and with an online survey. The survey first shows a shared ambition to combine different environmental benefits: carbon storage, biodiversity, water quality, landscapes. The merchant exchange must therefore relate to a basket of environmental goods. Secondly, the respondents formulate three types of vision of the good socio-economic outlines of the device:

- The first corresponds to a new logic of environmental goods securitisation: sell carbon stored on the international carbon market. This vision, which is the closest to the carbon market concept, is poorly represented in our sample.
- The second can be associated with a conventional contractual logic in the agri-environment: to be paid to cover the costs of maintenance of hedges, ensuring the traceability of the practice. This second logic prevails among farmers.
- A third logic emerges: the ambition of new connections between farmers and companies in local and communitarian devices. It prevails among companies.

Starting from a singular proposition of evolution of the modes of valorisation of the environmental services, this research thus points a certain inertia of the preferences of the farmers (on the object and the modalities of the device). Surprisingly, the ambition to found new connections between farmers and enterprises in a local and communitarian device seems more affirmed by companies than by farmers.

MAKING THE AGROECOLOGICAL TURN: IDENTIFICATION OF FARM-LEVEL SOCIOTECHNICAL ADOPTION FACTORS AND DETERMINANTS

Anda Adamsone-Fiskovica, Mikelis Grivins

Baltic Studies Centre, Latvia

The European Green Deal, which strives to move towards environment- and climate-friendly farming, stipulates a number of agroecological measures to reach this ambition. Some of the proposed technologies include intercropping, catch-crops, and green manure application on farms, which are practically feasible for the introduction of sustainable soil management in horticulture. However, until now their uptake has been quite limited despite the demonstrated effectiveness. The current research aims to systematically review the current state of the art of research and knowledge with regard to the factors that influence the adoption or non-adoption of the selected technologies by farmers. The search of peer-reviewed articles published in 2010-2020 was carried out in the Scopus and Web of Science databases. Based on a set of keywords, a total of 122 unique articles were retrieved for initial scanning for relevance, with the list subsequently narrowed down to 63 articles retained for full-text reading. There has been a gradual increase in the number of articles addressing the adoption of the selected technologies over the decade. In terms of the geographic scope there is a considerable lack of studies from Europe, with the majority covering Africa and Asia, as well as the USA. The selected technologies are mostly addressed with reference to conservation agriculture, best management practices, climate-smart agriculture, sustainable intensification, and organic agriculture. While there is a general lack of theory-guided studies, the most frequently used ones are the Theory of planned behaviour and the Diffusion of innovations theory. Empirical data collection methods cover a mix of qualitative and quantitative methods, yet these are dominated by semi-structured or structured surveys focusing on the correlations between the adoption and a set of variables. Some of the initial observations show that factors studied by researchers include a diverse range of internal and external ones spanning across agronomic, economic, technological, environmental, political, social and psychological domains. While mostly the focus is on farm characteristics such as farm size, land tenure, livestock ownership, irrigation system, soil quality, fertilizer use, as well as labour force, income sources, loans/debts, along with farmer traits such as age, gender, education, farming experience, employment status, there are studies also highlighting the role of farmer's objectives, motives, orientations, risk attitude, aesthetic values, cultural preferences, and social participation. Other explored factors include information sources, availability inputs and credit, distance to market, access to extension services, presence of policy incentives, not to mention place-specific climate and weather conditions.

SESSION 4.1. WORKSHOP: CHALLENGES FACED BY LARGE EUROPEAN PROJECTS DEALING WITH AGRICULTURE AND FOOD SYSTEMS: EVIDENCE FROM THE H2020 SALSA PROJECT

WEDNESDAY 13, 11.00-12.30. Sala de Docentes

Chairs: Maria Rivera Méndez, Paola Hernández, Teresa Pinto-Correia and Dionisio Ortiz Miranda

Small-scale farming is crucial for producing food and for sustaining the livelihoods of millions of people around the world, particularly in developing countries. But small farms are also very common across Europe, where they are neither anomalous nor irrelevant. Across regions from the Scottish Highlands to the Greek Islands, small farms are a dynamic part of the food system, providing employment, opportunities and food for thousands of people, and in fact, they are holding together the fabric of rural landscapes. SALSA (small farms, small food businesses and sustainable food and nutrition security (FNS) was a H2020 project that finished in July 2019. SALSA managed to provide a better understanding of the current and potential contribution of small farms to sustainable Food and Nutrition Security, by adopting a territorially based food systems perspective, focusing on availability, access, and control, and identifying weaknesses, strengths and risks in the food system and in particular in the role of small farms. SALSA also revealed the enormous diversity of small farms and food systems in Europe, and identified factors affecting their vulnerability and resilience, examining the relevant governance systems related to the organisation of small farmers in the food system. The project provided evidence and knowledge to support better informed and targeted public policies, as well as validated tools to guide decision-makers in enhancing the contribution of small farms. However, SALSA relied on complex methodological structures and tools: it studied 25 regions in Europe and 5 in Africa; and it combined the most recent remote sensing data and technologies with social sciences enquiry, participatory foresight analysis and transdisciplinary approaches. And although the project did achieve its main goals and set objectives, we believe that a transparent and critical reflection on some of the methodological gaps faced during the process can provide very interesting discussions and learnings to take forward when participating in similar projects.

We have identified a set of key methodological challenges that we would like to bring forward for discussion regarding for example: the transdisciplinary nature of projects, the science/policy gap, the application of the territorial approach, project's legacy and project's expectations vs reality. This session aims to discuss some of the above-mentioned gaps together with leaders and participants of other large European projects, with the aim of enriching the knowledge on these gaps and openly discussing possible solutions to overcome them. The discussion will be organised as a dynamic round table, where all session attendees will be more than welcome to participate.

ORGANIC REGIONS AS A MODEL OF ENDOGENOUS TERRITORIAL DEVELOPMENT? CONTRASTING AND CONTESTED DEVELOPMENT PATHWAYS IN THE BELLUNO PROVINCE, ITALY

Zollet Simona

Hiroshima University, Graduate School for International Development and Cooperation, Japan

In a global context where the unsustainability of mainstream agri-food systems is increasingly evident, initiatives to foster agroecology-based agriculture on a territorial scale and to promote the reconnection between producers and consumers have been multiplying. In this process, the so-called 'marginal' or 'less-favoured' areas are emerging as one of the key sites for this transformation. Owing to the limitations posed to agricultural modernization, these areas have often maintained highly diversified and multifunctional farming systems, which are now being re-valued as an asset upon which to build endogenous and sustainability-oriented territorial development strategies. One such example is that of organic regions, or organic districts, territories organized around a common vision of territorial development that has at its core organic farming and its values. Within a framework of endogenous rural development, organic farming has been shown to have positive outcomes in terms of benefiting the local economy by facilitating the reconnection of producers and consumers; generating employment in economically depressed rural areas; and providing ecosystem services that positively affect the environment, residents' quality of life, and also have positive impacts on other economic sectors, such as tourism. The establishment of an organic region is also portrayed as an example of participatory decision-making process that strives to ensure that all stakeholders' voices are heard. While the benefits of creating organic regions and their potential for scaling up sustainable agri-food systems have been emphasized, the concept of organic region itself is still in its infancy, and the beginning stage of the process through which these initiatives take shape hasn't received much attention. This paper focuses on the Belluno Province, in the north-eastern Italian Alps, an example of an historically marginalized territory in which organic farming has been emerging as a promising endogenous rural development instrument. At the same time, however, attempts at creating an organic region have so far met with mixed success, and the recent emergence of new actors and new development dynamics (particularly the expansion of intensive conventional vineyards) has further complicated the process. The research utilizes interviews conducted with organic farmers, local administrators, NPOs and civil society organization representatives to explore views and standpoints about the organic district proposal, and the often-discordant and conflictual dynamics and interests at play. The research also addresses the role of different categories of stakeholders, and how their stance and relative power affects their relevance in decision-making processes in the face of multiple and contrasting possible development pathways.

LINKAGES BETWEEN AGRICULTURE AND FORESTRY IN FOOD PRODUCTION: BUILDING RESILIENCE OF RURAL COMMUNITIES

Mikelis Grivins, Talis Tisenkopfs, Anda Adamsone-Fiskovica, Emils Kilis, Sandra Sumane

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We account for land characteristics using two approaches: either by referring to bio-geographical properties of land or by discussing the socio-economic use of land. Both approaches – the land cover and the land use – essentially allow to monitor and regulate the environmental processes and our socio-economic relations to land. Thus, these are crucial concepts linked to policies and sustainable development goals. Bio-geographical land cover is fixed – there can be changes in terms of what we are accounting for, yet this will not affect what is there to account for. Meanwhile, land use, as a category describing the social response to the properties of land, is socially constructed at all levels. This should not be perceived as a weakness of the concept but rather as a clear indication that the concept reflects the overall ideological beliefs dominating among the groups defining it. This paper discusses specifically the linkages between two of the land use types – agriculture and forestry. Agriculture and forestry are usually seen to be two distinct types of practical land use. However, evidence shows that such a separation might be losing some essential aspects of how linkages between the two types can be strengthening food supply chains and contributing to livelihoods of rural communities. This paper suggests studying relations between agricultural and forested lands to develop new models for conceptualising land use that would be more appropriate for the contemporary challenges associated with the two land use types. More specifically, the paper looks at cases when people use food production, processing or distribution to link the two land use types. The paper illustrates that by linking the two types rural inhabitants diversify the production and structure producers' relations to consumers, improve their livelihoods and ensure subsistence of communities, and even improve farmers' position in the agri-food supply chain. On numerous occasions the people engaged with agriculture or forestry link the two types to enhance their prospects and current social position.

FOOD SECURITY IN THE MEDITERRANEAN BASIN WITH AN ANALYSIS IN MACHINE LEARNING

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The Mediterranean region is a biome of specific richness of world importance, where population is constantly growing (from 446M in 2000 to 570M in 2025 – geoconfluences, 2014), urban development increases, while only 14 % of the Mediterranean region is devoted to agriculture and food production (118 million of hectares). Hence there is a need for a fine and detailed knowledge of the spatial issues at stake. Nonetheless, land use and land cover databases produced by each Mediterranean country are often heterogeneous with respect to the spatial scale, resolution or the methodology of construction. In the framework of three research projects (Arimnet/Divercrop[2], Agriville[3], Labex OtMed/LasetMed[4]), we built two resolutions spatial database (8-10 km and 2km) representing, between 2005 and 2015, detailed topography (altitude and slope), land cover (urban, natural vegetation, forest, crops, bare soils, etc.), bioclimatic variables (temperatures, precipitation, hygrometry, etc.) and socio-economic variables (population, agricultural practices, etc.). Besides the simple visualization of the variables and their spatial relationships, the constructed database allows to develop original research analysis at the scale of the Mediterranean basin on various subjects for example, food security, land systems or the relation between biodiversity and agricultural practices. For analysing the food security at a resolution of 8-10 km, this presentation will highlight the potential representativeness of variables with machine learning. For instance, we found that the density of population in the South of Mediterranean region appear is a strong determinant of wheat production. Indeed, the Population is a good incentive in the South of the basin (wheat may be a production close to the city) contrary to the North, where there is no effect (production areas and cities are not in the same location). Furthermore, we will explain the weight of others variables to explain the wheat production in the Mediterranean South (ex “cattle”, “altitude”) and field management in the North. Finally, we will present our findings with a finest resolution of 2km analysis to explain food production. The objective is to share our knowledge, confident that they will attract a great share of the participants of the IFSA Conference.

[2] https://divercropblog.wordpress.com/
[3] https://reseau-agriville.com/
[4] http://www.otmed.fr/

A JUST TRANSITION? JUSTICE PRINCIPLES RELEVANT TO FOOD SYSTEM TRANSITIONS

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In response to social and environmental injustices perpetuated by the dominant productionist view of the food system, an increasing number of initiatives are trying to make local food systems more sustainable and more just. These initiatives show which alternative food systems are possible and with the right propelling mechanisms they can help speed up the transition process towards a sustainable and just food system. However, it is important to also reflect on how these initiatives and propelling mechanisms contribute, or not, to a just transition of the food system. The concept of 'just transitions' was developed within the context of energy transitions and climate justice and brings together concerns related to distributive, procedural justice, and social justice for those working in and/or depending on the current dominant system. Within the food systems literature, justice plays an important role, including in the work related to food justice, food sovereignty and food security. However, few studies have adopted a 'just transitions' lens and it is unclear which principles of justice are particularly relevant to reflect on the justice of food system transitions. We reviewed the food systems literature to identify which principles of justice were used to assess justice implications of food system initiatives that had happened or were ongoing. We selected and analysed 138 papers. These papers covered very different types of initiatives in terms of scale - ranging from regional food networks to very local urban agriculture initiatives – and in terms of underlying values - with some initiatives strongly rooted in food justice and others in ecological sustainability. Across this diversity of initiatives, the review identified a number of principles related to distributive, procedural, and social justice relevant to food system transitions. Distributive justice principles included a.o. equality of outcome, equality of opportunity, and sufficiency. Procedural justice included a.o. equal opportunity to participate, legitimacy, transparency, and autonomy. Related to social justice, the papers discussed the principle of redistribution of costs and benefits, and of power, specifically to marginalised communities, to those with certain roles across the food system, to those who (have) suffer(ed) negative consequences of the food system, and to non-humans. The identified principles encourage a broader debate about the justice implications of food system transitions and can help food system initiatives, and propelling mechanisms, to reflect on the justice of the transition process itself.

LOCAL FOOD SUFFICIENCY IN THE MEDITERRANEAN BASIN - ENABLING AND CONSTRAINING FACTORS

Esther Sanz Sanz[a], Carolina Yacamán-Ochoa[b], Lamia Arfa[c] , Rosalia Filippini[d]

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Current land use is causing unprecedented changes in agriculture mainly because of urban sprawl, in particular on coastal or metropolitan areas. These main changes are not independent and act in a feedback chain: disturbance of traditional agriculture surrounding urban areas due to cities expansion that leads to the development of a market-oriented agriculture for the globalized market, while new forms of agriculture linked to the city are created. In other words, the new urban food agenda is addressing global challenges and developing place-based solutions as a means to enhance reliable food supply at a local and regional scale. In this context more research is required to address challenges of global urbanization and metropolitan growth and to develop place-based solutions The aim of this session is to identify key enabling and constraining factors of local food sufficiency (i.e. proportion of locally grown food which is consumed locally) as a means of food security, especially to hone in on options to deepen and broaden a transformative urban food agenda. Therefore, we invite papers to present and discuss current urban food systems dynamics including both land use and network interactions. Case studies involving stakeholder perception or/and statistical approach of the determinants of local provision of locally grown food products along the three major levels of the supply chain (agricultural production, food chain organization and commercialization) are welcome. This session could benefit from the contribution of some local case studies concerning some specific products, developed in the framework of the Arimnet2 project DIVERCROP (Land system dynamics in the Mediterranean basin across scales as relevant indicator for species diversity and local food systems). With these case studies, we are able to characterize the drivers of the re-localization of urban food systems in term of policy, processing infrastructure and social innovation. However, we would like to enrich the session with other papers focus on non-Mediterranean area.

"I AM SURE THEIR VET IS THEIR MAIN ADVISER": COMPLEMENTARY NETWORK STRUCTURES AND INNOVATIVE POTENTIAL IN SHEEP FARMING.

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Current health management practices in livestock farming are not sustainable, mostly because they select pathogens resistant to treatments. If integrated pest management is a common and accepted practice in agriculture, its animal counterpart is way behind. In other words, integrated health management in animal production embeds in so few practices that farmers do not recognize and advocate it per se. In this context, research and development is needed 1) to identify and design innovative livestock systems and management tools in line with integrated health management principles and 2) to better understand innovation dynamics in livestock farming. This article contributes to the latter. The aim of our study was to use social network analysis to explore how knowledge and information circulate among farmers, and between farmers and non-farmer stakeholders around the theme of parasitism control. For this purpose, we carried out a questionnaire-based survey among 550 dairy-sheep farmers in the Pyrénées-Atlantiques (France). We identified different network structures in which farmers evolve when dealing with parasitism control. In addition, we highlighted the kind of individuals likely to be involved into one network structure rather than another by analysing the farming systems and the farmers' representations in each network structures. Results are discussed in terms of implications for developing integrated health management programs that take into account the diversity of network structures and farmers identities.

TRANSITION TOWARDS SUSTAINABLE FOOD SYSTEMS: A FOCUS ON WORK, WORKERS AND WORKPLACES

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To reach sustainability, it is now well recognized that food systems need significant innovation and transformation of the existing corporate food regime. Many scholars analyse top-down innovations (innovations thought and promoted by some actors, e.g. engineers, for the benefit of other actors, e.g. farmers) and bottom-up initiatives (innovations developed by some actors for their own benefit). They investigate the complex dynamics of coupled innovations in technologies (e.g., recycling technologies, agronomic practices) and in non-technological areas (e.g., cooperation between food system actors, different organizational arrangements, consumption practices). However, few studies have precisely exploring how work, workers and workplaces are impacted by these transitions; and how work, workers and workplaces may be the catalysis of such transformations. Firstly, few studies have investigated "what eating at work is", and how eating at work is constrained by work dimensions, the work environment and the logics that are all vital to the development of the company such as finances, marketing, human resources, quality and sustainability. Indeed, studies on sustainable out-of-home eating mainly focus on territorial collectivities (e.g., school canteens, seniors' residences, hospitals). Secondly, few studies have explored how both bottom-up and top-down initiatives transform work activities, as well as how these changes are included in new sociotechnical arrangements. The research we will present focus on workplaces (e.g., companies) transition towards sustainable food practices and aims to explore work and workers at different scales: employees-consumers, workers concerned with the development of the local food system, managers, decision-makers, staff representatives. The research methodology combines (i) a data collection among employees and companies who take initiatives to develop food practices at work which are more in line with sustainability issues and (ii) an involvement in some associations which purpose is to support companies in developing sustainable food practices. Through our data collection, we wish to identify individual and collective actions of employees-consumers as well as actions envisaged and/or implemented by companies, to understand how the work of all stakeholders involved in the sociotechnical system is impacted by the sustainable transition (analytical part of the work). Through our involvement in associations which advised companies on sustainable food practices we try to equip them to open discussions with the various stakeholders in order to take into account the technical (technologies, artefacts), social (work organisation) and ideological aspects of transitions towards more sustainable food practices. As we only start our study, our presentation will be mainly theoretical and methodological.

THE CONSTRUCTION OF NETWORKS IN ITALIAN SOCIAL FARMING

Patrizia Borsotto, Michela Ascani, Carmela De Vivo, Giovanni Dara Guccione, Marco Gaito, Antonio Papaleo, Gabriella Ricciardi

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One of the declinations contributing to the development of social capital and networks of relationships within a community is social farming (SF), which in Italy, unlike what happens in northern Europe, is expressed mainly in terms of inclusion. SF is a complex activity that requires, for its development, the contribution of different skills and competences and, therefore, the creation of networks and complex relationships among several actors. This paper aims at presenting the results of the research activity carried out on a group of Italian social farming operators that participated to the summer schools or study visits organized by the Italian National Rural Network (NRN) between 2016 and 2018. The Report on Social Farming (RRN, 2017) has underlined networks that are built around social farming are complex both in terms of agreements and of the plurality of stakeholders involved. From these considerations the research tried to understand the relationships that have been created after participating in these moments and how much they improved the strengthening or the creation of territorial networks. We have collected and examined data from participants to the NRN events, focusing on the ways in which new links are formed. Our study contributes at understanding the relationships arising from the participation in these moments of information or training and how they have encouraged the strengthening or creation of territorial networks. The survey was conducted with qualitative methods and the tools used are the interview by questionnaire with CAWI methodology and through the application of Social Network Analysis (SNA) to map and describe the formal and informal links between the participants. In short, we have found that the network is not very cohesive due to the lack of links between many actors. The analysis has highlighted the high heterogeneity of the subjects involved, which in most cases is constituted by farmers. Finally, the network is active and inclusive, but it is also characterized by redundant links that may be poorly efficient and an obstacle to its further expansion. These elements highlight the complexity and difficulties that exist in creating relationships in social farming, since it is an activity that obligatorily involves operators belonging both from agricultural and from social world and, therefore, the need for a space that facilitates the meeting of these two worlds that can also be built through a greater knowledge and dissemination of social farming.

DEFINING PATHWAYS OF TRANSITION TOWARDS A DIVERSIFIED MILK VALORISATION: WHAT THE HISTORICAL EVOLUTION OF WALLOON DAIRY COOPERATIVES TELLS US

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Dairy cooperatives in the Walloon region do not valorise milk on a diversified pattern of added-value products despite of the agro-geographic characteristics of the region holding potential for it. As the valorisation of milk is dependent on the immobility of investments and strategical choices made in the past, we decided to explore the historical background of the present situation. By clarifying the past context and the actions taken by dairy cooperatives in this context, our objective is to: 1) enrich the understanding of the present situation by clarifying which contextual, structural and agent-related roots led to the present situation 2) reveal patterns of agency specific to the Walloon dairy sector that might hold significance in terms of future transitions. We conducted a historical analysis based on the exploration of archival material, oral sources, and published sources. We contextualized the evolution of dairy cooperatives as from the end of the Second World War up to the first decennia of 2000. That timespan saw the evolutions of milk transformation technology, market configuration, and public policies determine the development of dairies until today. Our results reveal that the Walloon dairy cooperatives followed an orientation mainly focused on the industrial production of milk powder and butter in response to the guaranteed market outcomes allowed by the Common Agricultural Policy as from the middle of the sixties. The technological investments put the cooperatives in a logic of international competitiveness based on the ability to rationalize the costs and to use the industrial tools to their maximal capacity. The structural characteristics of milk production (density, seasonality, farm-use of the milk) hindered the economic sustainability of this model in the Walloon region. The lack of coordination between dairies in a non-homogeneous political landscape and the inability to define merging strategies exempt of particular interests prevented the development of a concerted strategy to invest successfully in other pathways of milk valorisation. In a continuous context of growing International competition on the markets, the price paid to the farmers acted moreover against the capitalization necessary to sustain pathways of higher added-value dairy productions. We point out the tension between the function of farmer as both a *milk deliverer* and a *cooperator* as a source of difficulties to implement pathways of transition from an industrial model of milk valorisation.

INTERACTIONS BETWEEN AGRICULTURAL VALUE CHAINS AT LOCAL LEVEL: A METABOLIC APPROACH

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Main resource for human and animal nutrition, agricultural biomass has also high potential uses as substitute for non-renewable resources in other sectors (construction, chemistry, energy, etc.). It plays an important role towards the energetic transition. In that regard, public institutions, particularly at local level, highly support new biomass uses for food and non-food uses, for products (e.g. grains, livestock) and co-products (e.g. straw, manure), leading to value chain reorganizations and/or creations. To prevent from de-structuring the other existing value chains, or from escaping local energetic, environmental or socio-economic issues, it seems important to understand the interactions between value chains in place. For that aim, the framework of metabolism seems particularly relevant. It allows an analysis of the flows of materials and energy occurring between nature and society, between different societies, and within societies. Interactions between value chains can be characterized by material flows and an analysis of actors which produce or use agricultural products and co-products. However, due to value chain specialties, the complexity of actor networks and highly diverse localities, these evaluations are difficult to undertake at local scales. Our goal here is to present and discuss an approach to account for interaction within and between agricultural value chains, based on a representation of material metabolism coupled with an analysis of actors' networks. First, we build a theoretical metabolism, based on public databases to: i) inform on potential agricultural products and coproducts, ii) gather general information on local actors. Second, we lead a survey to consolidate this metabolism from the actual flows and develop a reading grid of actors' networks based on the forms of: i) circulation of material flows between actors; ii) organization and coordination of this circulation of material flows between actors; iii) synergies, dependencies and competitions between actors around these material flows. The main challenge is to structure these interactions in a global representation of the local agricultural metabolism. We show an application of the method on two French localities that are contrasted in terms of agriculture in: i) the North of the Aube department, an area specialized in large field crops; ii) the Vallée de la Drôme, farm fields are four times smaller and the agriculture is more diversified with different types of crops and livestock systems. This method can be used with local partners as a reflexive tool on agriculture and value chains and as a starting point for foresight studies.

THE ROLE OF RELATIONAL MARKETS AND FARMER AGENCY IN THE PURSUIT OF AGROECOLOGICAL PRINCIPLES AT FLEMISH BEEF FARMS

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In our exploration of what sustains and limits agroecological practices at beef farms in Flanders, the relevance of alternative food networks as an assisting or even a necessary factor in putting agroecological principles into practice became increasingly clear. The question remained, however, whether alternative, market-based arrangements could in any way be scaled up. This led us to analyse how alternative and not so alternative market exchanges were different and connected. In this paper, we navigate through the rich debates within economic sociology on the social structural basis of market exchanges. We identified two challenges: (i) synthesizing the emphasis of Marxian political economy on objective material relations, and the emphasis of actor-centred approaches on cultural rules in one theory of agency; and (ii) creating a single framework of market exchanges that accommodates the varying influences personal and impersonal relations among economic actors have on actual market exchanges. We argue that the work of critical realists such as Douglas Porpora on agency, and the heterodox economist William Jackson on relational markets can be instrumental in meeting these two challenges respectively. These reflections found their origin, however, in the analysis of semi-structured interviews conducted with Flemish beef farmers. In the second part of this paper, we therefore summarize observations that led us to question the adequacy of existing approaches to market exchanges in agro-food studies. By tracing the structural basis of the trading behaviour of these farmers, a fuller explanation of the absence and presence of alternative, market-based arrangements is arrived at.

SESSION 5.1. WORKSHOP: SUSTAINABLE DIGITALISATION FOR RURAL AREAS: HOW TO MAKE ECOLOGICAL AND DIGITAL TRANSITION CONVERGE?

Monday 11, 11.30-12.30, Room 124

Chairs: Julie Ingram, Pierre Labarthe, Leanne Townsend and Dominic Duckett

The green deal has identified two transitions for Europe: digital and ecological transitions. However, the links between the two transitions are not clear yet, and there is the risk that the policies supporting the two transitions don't speak to each other. This risk is particularly evident with rural areas, where it is even difficult to get accurate data on the level of digitalization. Drawing on projects such as DESIRA, Agrilink and FairShare, this workshop will discuss a research and policy agenda for sustainable digitalisation in rural areas. In particular, panelists will discuss, in the light of the respective findings, the following questions:

* How agriculture and rural areas are living digitalisation processes? How nuanced is the landscape of digitalisation?

* What are the likely scenarios of digitalisation in the next decade?

* How to create the ecosystem needed to make digital transition instrumental to ecological transition? What subjects, infrastructures, technologies, organizational methods are needed?

* What is the most suitable governance to exploit the potential of digital technologies in the ecological transition?

HOW DIGITALIZATION AFFECTS THE CAPACITY OF THE FARMING SECTOR TO ASSESS INNOVATION? THE CASE OF DIGITAL DECISION SUPPORT TOOLS FOR FERTILIZATION IN FRANCE.

Noémie Bechtet, Pierre Labarthe

INRAE, France

Promotors of precision farming claim these technologies can optimise agricultural production, value chains and food systems. In the specific case of fertilization, digitalization relies on the use of digital decision support tools (DSTs) that aim at optimizing yield of the crop production and limiting fertilizer losses that can cause nitrogen contamination of groundwater. DSTs aim at helping farmers in overcoming economic and legal challenges. Yet, several authors argue that there is a need for more evidence about the impacts of those tools on the sustainability of the farming sector. The question of the control of the recommendations given by these tools is particularly important. It is all the more relevant in a context where the privatisation and fragmentation of the supply of advice leads to new challenges about the control of the diffusion and evaluation of innovation. Moreover, digitalization transforms internal logics of advisory suppliers, with for instance the emergence of new needs of capabilities for advisory suppliers. In this paper, we aim at investigate the impacts of digitalization on the capacity of advisory suppliers of the farming sector to assess digital innovations that are subject to uncertainties and controversies. To do so, we conducted in depth semi-structured interviews with designers and diffusers of DSTs in France. The aim was to identify the evaluation activities of the innovation made along this chain, with a specific focus on the role of advisory actors from the farming sector. Preliminary results show that all actors realize intangible evaluation activities of the innovation. Private companies that design the innovation invest on data and analytics to build their expertise for such evaluation. Advisory suppliers from the farming sector (cooperatives, agricultural chambers and technical institute) support intangible but also tangible evaluation activities. Yet, they don't invest a lot of resources for evaluation activities. Hence, this paper underlines the changing role of advisory suppliers: they use digital innovations to charge farmers for their expertise but their investments to assess the innovation is limited. Growing differentiation between their investments in front office activities and back office activities highlights the risk that advisory suppliers lose their capacity to assess the innovation. This leaves the space for agribusiness organizations that design digital innovations to set the rules for an evaluation based on the use of analytics and data.

EXPLORING THE ADOPTION OF INNOVATIVE SPRAYING EQUIPMENT

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Plant Protection Products (PPP) industry and research have been developing more sustainable, novel PPPs; at the same time, spraying technologies have experienced important improvements in terms of efficiency and safety, including in their development the latest advances in electronics, data management and safety aspects. New PPP developments and the latest advancements in intelligent sprayers have further been complemented with a large list of Best Management Practices (BMP). Unfortunately, there is still an important gap between research developments and the actual use of the available tools and practices by farmers, especially for this large number of small and medium producers with limited access to relevant information. The H2020 project INNOSETA is organized to explore spraying application needs in the most commonly used crops (cereals, vegetables, orchards, vineyards and greenhouses) in seven European countries. The aim of INNOSETA is to set-up a Thematic Network on Spraying Equipment, Training and Advising designed for the effective exchange between researchers, industry, extension services and farming community. This network will link directly applicable research and commercial solutions and grassroots level needs and innovative ideas thus contributing to close the research and innovation divide in this area. The purpose of this paper is to explore factors impeding the adoption of innovative spraying equipment and relevant Best Management Practices (BMPs) as well as farmers' information and training needs (i.e. demands for/from extension/innovation support services). Data have been collected through a survey in 7 EU countries, based on a questionnaire addressing both adopters and non-adopters of innovative spraying equipment and BMPs. The questionnaire comprises the following sections: Farm data; Existing Spraying Equipment and Machinery; Innovative Spraying Equipment awareness; Adoption/Non Adoption of Innovative Spraying Equipment; Best Management Practices; Farmer's information seeking behavior on innovative spraying equipment; Farmer's opinion about technology (in general); Farmer's Innovativeness (in general); Farmer (demographics, SETA experience & training, etc.). A total of 348 questionnaires were collected and analysed using multivariate data analysis. Furthermore, 32 experts representing research/academia, the industry and extension/advisory organisations have been interviewed (aide-memoire). The combination of the analyses of the two data sets are expected to produce interesting results concerning the adoption of such technologies and practices and the (potential) role of advisory/extension services.

FORESIGHTING THE FUTURE OF DIGITAL AGRICULTURE: FOUR PLAUSIBLE SCENARIOS

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Digital technologies offer agricultural systems around the world a myriad of potential opportunities. For some, the future has never looked brighter, for others it is more uncertain. To prepare for change and to understand the potential opportunities and consequences of smart farming technologies, fore-sighting is a recognized methodology to anticipate, learn and design strategies for change. Scenarios produced through fore-sighting are not guarantees of the future but ways to spark thinking and prepare for the unknown. This paper presents the results of a foresighting workshop that examined future smart farming scenarios in Australia. The workshop was conducted in Brisbane, Australia, in 2018 with leaders of CSIRO's 'Digiscape' future science platform - an initiative to build common big data infrastructure to transform decision-making and environmental action in Australian agriculture. The fore-sighting workshop posed the question: what does the future of Australian agriculture look like and what are the implications? Key social, economic, environmental, and technological trends that might impact agricultural knowledge and advice networks and supply chains, both in Australia and more globally, were presented and refined at the workshop. From this, four plausible future scenarios emerged. Eight trends were identified: Accessibility and Connectivity; Proliferation and Integration; Consumer Demand and Traceability; Human and Social Capital; Globalisation; Farm Business Model Change; Environmental Stewardship and Services; and Resource and Environmental Uncertainty. From these eight trends, two axes were chosen to capture the most important drivers of change. The axes were: Resource and Environmental Uncertainty (vertical axis) and Farm Business Model Change (horizontal axis). The two axes created four quadrants which were each worked through by a different group at the workshop to produce four scenarios describing Australian agriculture in 2030. They were named: "Struggling", "Innovating", "Surviving" and "Thriving". The scenarios serve as simple outlines of complex realities from which short to medium term inferences relating to digital agriculture can be explored and understood. They are not mutually exclusive or guaranteed, but they offer insights into potential issues and opportunities for digital agriculture development in Australia and more broadly. The implications identified from the scenarios, with lessons and potential applications for Digiscape and other digital agriculture projects relate to potential changes in farm business models, potential opportunities for new and improved decision making, both by landholder and others, potential beneficiaries and inequities of new technologies and interactions with digital technology and other components of food supply chains. The paper describes the scenarios and their implications in specific terms (changes that have been made to the strategic orientation of Digiscape) and more generally (lessons for other initiatives around the world).

POTENTIAL OF USING ICT TOOLS FOR CROP DISEASES MANAGEMENT AMONG HETEROGENEOUS FARMERS IN RWANDA

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Social interactions among farmers, extension agents, and government officials play a critical role in knowledge development and exchange, uptake of new practices, collective decision-making in agricultural practices. This is especially evident in developing countries where small-holder farming systems and subsistence agriculture prevail. Smartphones and new communication tools are likely to transform the way information exchange and social interactions take place. However, how these ICT developments will influence the communication and social interactions among farmers, and decision-making of farmers are intriguing questions, yet to be studied. Thus the aim of this study is to evaluate the use and experience of ICT of banana growers in Rwanda within the context of establishing an effective method for prevention and control of Banana Xanthomas Wilt (BXW), an infectious plant disease. Specifically, we want to assess whether farm clusters associate with the different behaviours and perceptions of the use of ICT. A structured questionnaire was used to collect household information from banana growers (n=690) in 8 representative districts across eight (out of ten) major agro-ecological zones within Rwanda. A combination of principal component analysis and cluster analysis was used to develop a farmer typology of banana growers. Three types of banana growers were identified, namely, i) Beer banana farmers characterized mainly by proportion of land allocated to beer banana and proportion of beer banana sold, ii) Livestock based farmers characterized mainly by high tropical livestock unit and higher education years of household head, and iii) Cooking banana farmers characterized mainly by proportion of land allocated to cooking banana and proportion of cooking banana sold. We then conducted a statistical analysis to regress the use of ICT on the farmer typology and other socioeconomic control variables. Results showed that cooking banana based farmers are more likely to own a smart phone and perceive ICT as very useful in effective control of BXW whereas beer banana farmers are less likely to own a smart phone; and they tend to perceive ICT as irrelevant in controlling BXW. Beer banana farmers are mainly limited by not knowing how to use these services which is associated with their low level of literacy while Livestock farmers prefer to get information from other sources. The studied farmers provide potential for using ICT (Mobile based) extension services however beer banana farmers, less likely to own smart phones, are limited to few options.

IS FARMING TECHNOLOGY INNOVATION LOCUS DEPENDENT? MAKING-OF AN AGRICULTURAL FAB LAB

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Innovation has multiple targets –products, production processes, marketing, stakeholders' organizations, etc. – whose nature depends upon the socio-technical framework that orients the match between inventions and market. Amid the wealth of options to facilitate innovation, fab labs are a specific example of the digitalisation era. Originally, a fab lab is "the educational outreach component of MIT's Centre for Bits and Atoms" whose identity is defined by a charter that connects local labs to global network. Fab labs' goal is to provide stimulus for local entrepreneurship as well as for learning and innovation by providing access to tools for digital fabrication. This paper analyses the making of AgriLab, a fab lab dedicated to open innovation towards sustainable agriculture, spanning from equipment to digital tools; in particular, we question its role as a catalyst for the emergence of relevant farming technology innovations in the local and wider context. AgriLab is based in Beauvais (northern France), together with several other actors of farming innovation, belonging to the French region with the highest share of arable land. We adopt a genetic-like analysis (i.e. genotype x environment x management practices), by addressing the interactions between the historical identity of each actor, the features related to the place where they are based and the governance system of their interactions. Main local actors include: (1854) UniLaSalle, a higher education institute in earth and life sciences that hosts AgriLab since 2018; (1960) Massey-Ferguson tractor manufactory, the European most important AGCO production site; (1983) Isagri, UniLaSalle spin-off and European leader in the development of farm management software; (1986) RS, distributor of industrial and electronics products and the biggest European warehouse of Electrocomponents; (2019) Farmr, emerging start-up claiming to be the first agricultural social network that use digitalisation to facilitate farmers' exchanges to solve specific issues. Of notice, also local agencies of Credit Agricole, world's largest cooperative financial institution, and CER France, leading association and consultancy network in France, are committed to AgriLab territorial anchorage and wider development. The paper is structured in three sections: (1) summary of the main local actors' history; (2) driving factors analysis of these actors' activities to highlight the locus dependent features; (3) description of internal and territorial governance that could explain future orientations of farming technology innovation. These sections set the background for understanding the role that AgriLab could play to catalyse the emergence of relevant (digital) technologies for sustainable agriculture within this innovation ecosystem.

SMART FARMING AND SHORT FOOD SUPPLY CHAINS: TWO DIAMETRICALLY OPPOSED ALTERNATIVES OR TWO SIDES OF THE SAME COIN?

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Both smart farming and short food supply chain (SFSC) schemes are considered as promising alternatives to the conventional forms of producing and distributing agrifood products, having the potential to mitigate the environmental impacts of agriculture, to increase farmers' income and to produce new forms of value. Nevertheless, although smart farming has gained considerable momentum over the last few years, the integration of digital technologies and intelligent decision support systems in SFSCs has not yet been achieved. In this work, following a mixed research design, we aim at identifying farmers' and consumers' perceptions of and attitudes towards "smart SFSCs." Our results indicated that, although consumers who buy from SFSCs have a positive attitude towards smart technologies, they believe that their application in SFSCs will alter the unconventional character of short supply schemes. Such a "conventionalization" of SFSCs will lead to a change in farmer-consumer relationship, thus weakening the link connecting them. Farmers who participate in SFSCs express a mixed attitude towards smart farming since they perceive smart technologies as tools able to facilitate the achievement of higher efficiency but, on the other hand, they afraid that adoption of these technologies will create the need to restructure the modus operandi of farm enterprises. In both analyses, price and cost concerns were found to be important predictors of the general attitude towards smart SFSCs, but their contribution to predicting willingness to engage in smart SFSCs is limited. On the contrary, this (un)willingness is mainly driven by the symbolic content attributed to alternative food networks by both consumers and farmers. Qualitative findings confirmed that the major obstacle for the exploitation of smart technologies in SFSCs is their perceived incompatibility with the alternativeness of short supply schemes. For consumers, this incompatibility refers to the transgression of their imagery surrounding the concept of SFSCs, whereas for farmers it is associated with the need to redefine (once again) the meaning of farming. However, both samples were found to agree that the integration of smart technologies in SFSCs can increase the sustainability of short food supply schemes. Hence, smart technologies are viewed simultaneously as enablers of sustainability and as threats to the optimally distinct identity of SFSCs. In sum, these results reveal that smart SFSCs are conceived by both consumers and farmers as a Yin and Yang, combining seemingly opposite but potentially complementary paths towards sustainability.

HOW DIGITALISATION INTERACTS WITH ECOLOGISATION? PERSPECTIVES FROM ACTORS OF THE FRENCH AGRICULTURAL INNOVATION SYSTEM

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Two major agricultural transformations are currently being promoted worldwide: digitalisation and ecologisation, that include different practices such as organic farming and sustainable intensification. In the literature and in societal debates, these two transformations are sometimes described as antagonistic and sometimes as convergent but are rarely studied together. Using an innovation system approach, this paper discusses how diverse ecologisation pathways grasp digitalisation in the French agricultural sector; and do not discriminate against organic farming. Based on interviews with key representatives of conventional agriculture, organic agriculture and organisations that promote or develop digital agriculture, we explore how these actors perceive and participate in digital development in agriculture. We show that although all the actors are interested and involved in digital development, behind this apparent convergence, organic and conventional actors perceive neither the same benefits nor the same risks and consequently do not implement the same innovation processes. We conclude that digitalisation has different meanings depending on the actors' paradigm, but that digital actors fail to perceive these differences. This difference in perception should be taken into account if digital development is to benefit all kinds of agriculture and not discriminate against organic farming and more widely, against agroecology.

SPECIALIZATION, ABANDONMENT AND PERIURBANIZATION TRAJECTORIES ON MEDITERRANEAN LAND SYSTEMS. A PARTICIPATORY ANALYSIS FOR THE CASE STUDY OF THE COMTAT VENAISSIN (SOUTHERN-EAST FRANCE)

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The Mediterranean is at the same time a region of stark social and ecological contrasts and a global biodiversity hotspot, where complex local evolving land use patterns compose the region's landscapes. In this context, we aimed to identify key drivers of land system dynamics and future possible scenarios to increase territory resilience in a local case study of the south-east of France (Comtat Venaissin, Vaucluse department) involving territorial stakeholders. The choice of this case study is based on global previous quantitative analysis of land system dynamics at Mediterranean basin scale, from which we operated a downscale and pursue a local analysis based on qualitative approach and stakeholders' knowledge. Through a methodology based on both participatory approach and semi-structured interviews, we analysed stakeholders' perception about ongoing dynamics and their drivers in farming and land systems, but also within the same farming systems, in terms of farming practices. In particular, we implemented a "Territory game" methodology, pushing stakeholder to work on a spatialization exercise, identifying territorial dynamics perceived as positives or negatives, and to formulate territorial issues linked with land, farm and food systems. Stakeholders' foreseen and desired futures for their lands completed this characterization of current dynamics, and will be compared to actual patterns and tendencies. We identified two main changes in land and farming systems that involve several dynamics. The first one is a process of specialization, at territory scale but also within farming systems, which is strongly linked with vineyards expansion dynamic and has a landscape homogenizing effect. Farmers' choices, that are determined by an objective of profitability and depend, inter alia, on food sector functioning, on sanitary pressure and quality label areas, mostly explain this dynamic. The second one is agricultural decline as a result of periurbanization and land speculation, but also linked with agricultural vitality loss. Those dynamics raised various territorial issues, such as the fostering of land access or the conservation of agricultural and landscape diversity, to which we can respond by consolidating some modest dynamics perceived positively by stakeholders. The implemented approach allows us to verify global assessed land system typology and dynamics, and to deeply understand the process behind them.

TRAJECTORIES OF CHANGE IN OLIVE GROVE EXPANSION AND INTENSIFICATION IN THE ALENTEJO (PORTUGAL): TESTING A LANDSCAPE APPROACH TOWARDS MORE SUSTAINABLE FUTURES

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Olive groves in Alentejo (Portugal) have exponentially increased their extent and intensiveness over the past 15 years. This has been driven by the rise in global demand for olive oil, in the availability of water for irrigation and by a strong political and social support. As a result of this, whilst in 1998 olive groves in the Alentejo occupied 144,759 hectares (15.38 % of which were irrigated), in 2015 they occupied 169,869 hectares (28.86% of which were irrigated, including 18.32 % located in the Alqueva irrigation system) (EDIA 2016). In parallel, the traditional farm structure in olive groves is shifting towards land concentration in areas with access to irrigation, and towards property fragmentation and abandonment in marginal lands. Nonetheless, the existing governance framework is fragmented and has gaps, with policy tools focusing on individual aspects of the system, such as preventing the cutting of olive trees (Despacho Normativo 1/2002) or regulating the price of water (Despacho 3025/2017). This is all largely underpinned by technological-innovation discourses, with governance and social innovation largely missing from the discussion. A much-needed overarching governance strategy and vision for more sustainable futures of the sector remains absent. In response to such pressing challenges, this paper will discuss the hypothesis of whether a landscape approach can contribute to build novel governance frameworks that drive olive-groves towards scenarios of increased sustainability. The main goal of the paper is to discuss how these gaps in governance can be filled by designing and testing a landscape approach (Sayer et al, 2013; Sayer et al, 2016; Reed et al, 2017) that can ultimately foster the co-construction of a more sustainable land-use system. To achieve this, the paper will begin by identifying and characterizing the current mosaic of olive groves and land-management models and their current trends. This will be followed by an analysis of the governance actors, networks, levels and institutions driving change in the sector, including the discourses that underpin key challenges, such as sustainable intensification, and the role potentially played by a landscape approach. Scenarios of future change (business-as-usual vs others) will be then discussed with a view on the next CAP cycles (2020-2032), including one underpinned by adopting a landscape approach. Research in this paper is based on a trans-disciplinary approach, ultimately aiming to contribute to knowledge co-construction.

MAPPING PREFERRED TRAJECTORIES OF LOCAL DEVELOPMENT IN SOUTHEAST PORTUGAL

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Mediterranean land systems are amongst the most susceptible to global change, in part due to the region's vulnerability to climate change and misfit within a high production demanding political and societal setting. The impact of global drivers at a local scale, i.e. the possible trajectories of change of a territory, are context dependent, and to some extent dependent on how local actors perceive them and act upon them. In this study we focus on the territory of Serpa, Mértola and Alcoutim – three municipalities from southeast Portugal – to understand how different actors from across the territory anticipate the development of the territory and its land systems. We have conducted 22 interviews to collect individual perspectives and gathered 23 to play the *territory game* to find collective perspectives. The territory game is a participatory tool that uses a ludic approach to diffuse possible tensions whilst building a common vision for the territory. 5 of the interviewees also played the territory game, and all involved are territorial actors – individuals or institutions with stakes and/or that operate within the territory, including NGO's, local and regional administration representatives, farmers' cooperatives. From our results we get a picture of a depopulated territory, constrained by ill-adjusted policies to its harsh conditions. Perspectives for the development of the region are grounded on these concerns, and in particular on water availability, soil loss, and difficulty of placing products in the market. Yet, we found contrasting preferred trajectories of development in both the individual and collective perspectives. In one hand there is a preference for prioritizing traditional land systems, usually rainfed and multifunctional. Contrasting, it is recognized a need for hydro-agricultural infrastructures that would increase water availability and allow for profitable agricultural activities and thus fixate population. We also found a duality, but no rivalry, in commercialization strategies for local products. There is a wish for self-sufficiency of the territory, with strong local markets. Simultaneously, it is acknowledged a quality to the products with potential to be valued in wider markets. The different perspectives are partially reflection of the different edafo-climatic conditions found in the territory. The next challenge is to understand if and how they can be integrated in the territory in a common strategy plan.

ACTORS, SCALES, SPACES DYNAMICS LINKED TO GROUNDWATER RESOURCES USE FOR AGRICULTURE PRODUCTION: DRIVERS OF CHANGE AND FUTURE PERSPECTIVES OF THE TERRITORY IN HAOUARIA PLAIN, TUNISIA- A TERRITORY GAME APPROACH

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Groundwater resources became a recognized enabler of important rural and socio-economic development in Mediterranean countries. However, the development of this groundwater economy is currently associated with an increased pressure on the available resource and negative implications on the socio-ecological system. While there is a wide recognition that resource degradation threatens the sustenance of the agricultural system and the region's economy, viable strategies for effective water resources governance have not been forthcoming. Managing complex socio-ecological systems, such as occur in water resource management, is a multi-actor, multi-scale and dynamic decision-making process. Such a complex process involves a diversity of stakeholders. Local case studies developed in the framework of the Arimnet2 project DIVERCROP (Land system dynamics in the Mediterranean basin across scales as relevant indicator for species diversity and local food systems) have the purpose to characterize the current spatial agricultural dynamics, linked to the groundwater use, trends and impacts on agricultural practices, species diversity and local food systems. We chose to apply a territory game in the Haouaria Plain, in Northern Tunisia, where farmers are currently dependent upon groundwater use for their livelihood and food security. The territory game is used as a collective learning and collaborative construction tool for building common representations of the future of the territory, perceived by local actors and planned by more global decision-makers. The perception of the territorial dynamics revealed three main issues: (i) the land fragmentation and the increasing urbanization, (ii) the agricultural products' marketing and the trade monopolies, and (iii) the pollution caused by agricultural and industrial activities. The local stakeholders emphasized the need to strengthen water resources management policies, farmland protection laws and farmers' collective organization, reforming regulated markets and providing farmers with alternative market opportunities. The local stakeholders coordinate actors, activities and spaces on their territory. Spaces such as El Garâa basin, littoral forest or transformation units are at stake to develop an integrated response to territorial issues. Local initiatives and global dynamics involve preservation of agricultural land, water management and territorial governance for an integrated development. These drivers of change have to be taking into account by the policy decision-makers.

LEARNING THROUGH SCENARIOS TO SUPPORT THE SUSTAINABILITY OF EU FARMING SYSTEMS

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The increasing globalisation of food is affecting the European farming systems with growing market complexities and risks that require greater adaptive capacities, skills and smarter tools in farm and food chain management. Those tools and capabilities appear to be strongly influenced by learning processes. Learning processes are positively co-related to an improved capacity to successfully manage the farming system's conditions and changes across future scenarios. While farming systems can employ different learning patterns, the latter are mainly scenario-driven and focus on "glocal" objectives formulated by individual or networks, which are - in turn - affected by the ongoing management options and visions, as well as by limited local resources (including government extension services). If something is missing in this patchwork of skills, resources and local visions throughout participatory scenario analysis, farm managers and actors are forced to move within a temporal dimension across future alternatives and start thinking in more creative ways. The opportunity to develop more sustainable farming systems presupposes that farmers agree to include new environmental concerns in their action choices, so it implies a dynamic that entails a progressive change in their abilities and motivations to question the validity of the technical and normative knowledge acquired through past-intensive farming models. The farming system literature primarily deals with well-defined and static categories of farms, but only few papers include a temporal dimension and analyse the dynamic behind the farmers' decision-making process of learning through scenarios. Scenarios are highly temporal constructs, concerning future state of farming, with the objective to influence current decision making and action choices. There is a plentiful literature on time and temporality within sociology/geography, but this has only been sporadically integrated in the farming systems literature. In this paper we analyse how scenario analysis can further contribute to develop smart and tailored learning processes at the regional and local levels in order to tackle a key challenge for European agriculture, namely support for sustainability of production and marketing in diverse farming systems. This paper presents key results of critical reflections jointly made by researchers and stakeholders focusing on wine in Italy and olive oil in Portugal, poultry in Denmark, throughout participatory workshops aimed at the co-creation of future scenarios. Our findings provide science and policy making with insights into how farmers learn to make strategic and tactical decisions against potential future scenarios for their farming systems. The scenario analysis implemented encouraged an active learning process that influenced participants to re-examine the validity of their technical, experiential, and normative knowledge, which legitimise their reason for acting. The discussion shows which type of scenarios are favoured, actualised and how farmers collectively legitimise or avoid specific decisions in each scenario settings. Scenarios as a "future generating device" have a key role in the strategic process that guides agricultural actors to integrate specific knowledge, moral obligations, and sustainability principles to re-examine their decisions.

GREEN INFRASTRUCTURE FOR ECOLOGICAL AND STRATEGIC TERRITORIAL PLANNING TO IMPROVE THE INTEGRATION OF AGRICULTURAL LANDSCAPES

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Agrarian landscapes, biodiversity, and local food systems are facing multiple challenges in metropolitan areas. These challenges are caused by factors such as the intense urban sprawl in metropolitan regions, the neo-liberal policies on the deregulation of land use, and the ever-increasing disconnection between the areas of production and consumption caused by the globalization of agri-food production. The effects are multiple such as changes in land use, rupture of inherited socio-ecological networks, fragmented agrarian landscapes, loss of connectivity, deterioration of biodiversity, and regression of traditional agricultural activity. In this context, the European Union's 2020 Biodiversity Strategy highlighted the urgent need to extend conservation initiatives beyond protected areas and expand conservation measures to the entire territorial matrix through the creation of Green Infrastructure (GI). Although this territorial instrument is not exempt from criticism, from our point of view, it can be innovative in the way of dealing with different problems because of its holistic approach. Essentially because it offers a variety of practical solutions based on nature for a wide range of ecological, socioeconomic, and territorial problems, which can represent a turning point in the initiatives to address sustainable planning of the open green spaces in metropolitan areas more intensely subjected to urban sprawl. A recent critical literature review of recent literature on the subject, of the last 10 years, highlights the gap that exists in most research papers related to the analysis of the functions and the provision of ecosystem services of the territorial matrix from a socio-ecological approach. Based on the lack of attention paid, in both academic research and policies, we propose from a more innovative socio-ecological approach, to give more weight and visibility to the territorial matrix (composed mainly of agrarian landscapes), to improve the territorial resilience from a biological, ecological, and social point of view. This is since the conservation of the agrarian matrix will affect the functionality of the network, reducing the urban pressure of the nodes-composed of areas that host high biodiversity- and decreasing the fragmentation of the corridors - that ensure ecological connectivity. For this reason, it is also necessary to reverse the secondary role assigned to traditional agriculture in GI planning as in general in strategic planning (Feria and Santiago, 2015), since a is necessary for the sustainable management of landscapes that maintain agroecosystem services. In conclusion, GI must contribute to strengthening sustainable agriculture and its landscapes from a multifunctional and territorialized perspective, through specific instruments, promoting the inclusion of agricultural parks, capable of activating local agriculture, particularly peri-urban agriculture, the conservation of fertile spaces of the territorial matrix, and the agrobiodiversity of agroecosystems.

FARMERS' PERCEPTIONS OF LEVERS AND BARRIERS TO CROP-LIVESTOCK INTEGRATION BEYOND FARM LEVEL. A CASE-STUDY IN FRANCE.

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Integrating crop and livestock is broadly seen as an ideal option to maintain agricultural production levels while limiting environmental impacts on soil and biodiversity. Still, European crop-livestock farms keep declining due to globalized markets, agricultural policies and limited availability of workforce and skills. Reconnecting neighbouring specialized crop farms and livestock farms through grain, fodder, crop by-products and manure exchanges could be an alternative to overcome these limiting factors. Up to now, such collective organization is still rarely observed despite its potential advantages. In this study, we tried to understand farmers' perceptions to highlight levers and barriers to crop-livestock integration beyond farm level. We analysed interviews of 19 farmers interested in building such collaborations in Ariege, South-western France (8 crop farmers, 7 livestock farmers and 4 crop-livestock farmers). We observed different levels of involvement considered by the farmers ranging from wishing to buy local feed or establish new crops only if a local cooperative was creating contracts, to wishing to build a strong collaboration among local group over time. Different types of collective organization were mentioned, ranging from polycentric organization involving only farmers up to a governance through a local cooperative. The main barriers were related to logistics and storage, time management, low costs of inputs as regards to the time needed to implement such local cooperation, and establishment of trust. The main levers were the existence of local cooperatives or machinery groups that could drive the project and establish contracts, new policies oriented toward collective actions and a niche-market that recognized the interest of local feed for livestock. We highlighted a strong implicit divergence between the mindsets of crop farmers relative to livestock farmers that could hinder this type of local cooperation as they have few relationships and low trust. We suggest that farmers that already have both crops and livestock may be an ideal-type to improve ties between specialized farmers. In-depth analysis of farmer motivations and long-term efforts to build strong local networks and new policies would thus be key to favour the development of crop-livestock integration beyond farm level.

USING TRANSITION ZONES TO RE-THINK BIODIVERSITY-YIELD RELATIONSHIPS IN AGRICULTURAL LANDSCAPES

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Agricultural landscapes have constantly been re-shaped due to changing land use, political structures, and societal demands. The resulting fragmentation has made transition zones between different farming and other land use systems dominant features in agricultural landscapes. Transition zones are areas where two land uses interact. These interactions are shaped by the shared abiotic and biotic gradients, with consequences for biodiversity-yield patterns. Land use intensity can shape transition zones by creating sharp or gradual edges. When investigating the relationship between biodiversity and yield in transition zones, it is impossible to do so without addressing land users, since they make management decisions based on their observations of the environment surrounding land use and property boundaries. Their management decisions affect neighbouring land users, and both have to interact with each other, by sharing rights and responsibilities across field and property boundaries that could either correlate or mismatch with ecological spill-over effects. Moreover, different land users may have different priorities for their fields and field edges, with repercussions for biodiversity-yield patterns. Understanding ecological patterns that cross boundaries between land uses and habitats is central to identifying how agricultural land use affects biodiversity-yield relationships across landscapes. Moreover, combining information on ecological patterns with social changes (e.g. shifts in legal boundaries between land uses), could allow for a stronger representation of how land use systems interact within landscapes. Both social and ecological research on transition zones in agricultural landscapes could help shift the paradigm away from a compartmentalized understanding of biodiversity – yield patterns towards considering biodiversity and yield as jointly addressed in management practices for site-specific conditions, especially given the prevalence of transition zones throughout agricultural landscapes. This kind of approach could inform collaborative landscape management practices for achieving desired synergies between biodiversity conservation and food production. Here, we review and discuss transition zones and provide a preliminary road-map of how to research and use these areas for effective landscape integration of different land uses.

CO-DESIGN OF INSECT-FRIENDLY FARMING SYSTEMS AT LANDSCAPE LEVEL

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Insects play a crucial role for the functioning of our ecosystem but they are decreasing in numbers and variety. Agricultural landscapes, which cover more than half of Germany's total area, can provide vast insect habitats if they are managed accordingly. So far, there is a lack of implemented insect-friendly farming systems, which calls for accepted solutions. However, little is known about stakeholders' perspectives concerning their problem awareness, attitudes, current behaviour, or solutions. The project aim is to jointly develop insect-friendly farming systems at landscape level that are beneficial for insects and economically viable, e.g., through the establishment of flowering bioenergy crops. By involving agri-ecologists, entomologists, social scientists, and stakeholders (farmers, landowners, farmers associations, advisory services, nature conservation organisations, decision-makers, etc.) we initiate an integrative and collaborative process with iterative feedback-loops, which encompasses the following steps: (1) stakeholder perception analysis on guiding principles for insect-friendly farming systems, (2) group discussions on suitable measures at landscape level, (3) qualitative acceptability analyses, (4) joint mapping to identify options to transfer measures to other settings. In the paper we will present preliminary results of the stakeholder perception analysis on the guiding principles which is the first step of the co-design process. We apply semi-structured interviews and media analysis as data collection methods. For data interpretation we use qualitative content analysis. Excepted results include: (1) competing perceptions and values among stakeholders (open-minded vs. sceptical stakeholders); (2) ecosystem services provided by insects play minor role for farmers; and (3) some farmers feel that the image of agriculture has been tarnished by insect biodiversity discourses. The results will be considered in the further steps of the co-design, especially in the development of measures on landscape level. Generally, the project outcome is embedded in the broader challenge to contribute to the initiation of a system change that encourages a rethinking of current agricultural system and supports establishing an innovation niche.

WHAT LEARNING ARRANGEMENTS TO ACCOMPANY INNOVATING AGROECOLOGICAL MANAGEMENT OF LANDSCAPE RESOURCES ACROSS SCALES? LESSONS FROM THREE CASE STUDIES IN WESTERN FRANCE.

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In the last decades, landscape changes in north-western France have been marked by a significant development of large livestock-cropping farms and of urbanized poles, but also of alternative agricultural systems (e.g., organic farming) and initiatives for regenerating cultural landscapes (e.g., bocage landscapes). In this context, developing research studies in landscape ecology /agronomy /management, in partnership with local actors (from farmers to local authorities), to foster sustainable practices of management of landscape resources, led us to point three main difficulties. They are related to: 1) the need for local actors to deal with uncertainties in the relationships between landscapes, management practices and ecological functions, 2) the mutual relative ignorance of farmers and land-use planners about their respective contribution to the landscape dynamic, 3) the gaps between agricultural and land-use planning schemes, and between these policy schemes and the local initiatives, in terms of involved actors, scales, objectives and processes. We present lessons learnt from three case studies, from field to regional scales, in which we are dealing with these difficulties by designing and testing learning arrangements with local actors. In the first case, with a group of farmers innovating in bocage agroforestry, we extend an agronomic diagnosis approach by integrating indicators of ecological functions, factors at play (landscape and practices) and farmers' management resources. In the second case, we propose realistic simulations of the contribution of farming production activities to landscape dynamics, as a support tool for land-use planning. In the third case, to support groups of actors in the design, the implementation and the ownership of green infrastructures, we propose a process in successive stages and tool kits for organizing local experiences.

REWILDING THE RISK SOCIETY ON SMALL FARMS

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Sustainable Development Goals around environmental goals to both mitigate anthropocentric climate change and promote biodiversity typically involve productivity tradeoffs for the agricultural sector as it is currently configured. Feeding the world's burgeoning population has been historically met with initiatives to significantly increase food production by extending agriculture at the expense of wilderness and has included the suppression of wild animals alongside an engineered reduction in biodiversity. Arguably this has been the global pattern over the millennia but, more than ever before, Food and Nutrition Security agendas are framed in terms of raising global farm production between 50-100% by 2050. Farmers, who have traditionally seen wild nature as a risk to their livelihoods, have achieved increases by controlling wild predators and taming the wilderness. Radical rewilding supporters promote rebalancing traditional agricultural practices in favour of widespread restoration of wilderness areas and purposive reintroductions of wild species including the same predators that farmers have hitherto controlled. Rewilding, as a tool to promote environmental goals, tends to have decreased agricultural productivity even where some food production is encouraged; conversely, increasing farm productivity has not been generally approached through rewilding. The SALSA project[5] has engaged with small-scale food system actors cultivating land and raising livestock across Europe and Africa, often in remote or less favoured areas (LFA). Their farms are often considered prime sites for rewilding and afforestation initiatives, or are adjacent to spaces already subject to special designation, for example National Parks and wildlife reserves. This is partly owing to what has been viewed as the marginal contribution of small scale agriculture to wider food systems. SALSA stakeholders across Europe and Africa, when interviewed about constraints to food production, complained about predatory and destructive wild animals. More food could be produced, many contended, through de-wilding rather than re-wilding particularly in relation to predator control for livestock. Even small farmers advocating rewilding recognised corresponding production constraints. 'The Risk Society' contextualises risks within modernity offering a lens to explore what have been perennial risks for farmers, yet can be seen as products of advanced farming systems, modern institutional contexts, contemporary values, and neo-liberal political structures. Our paper examines the self-reported experience of small farmers in dynamic landscapes and the rapidly evolving governance environment reshaping the small farming world.

[5] SALSA is a Horizon2020 project conducting research into small farms, small food businesses and sustainable food and nutrition security http://www.salsa.uevora.pt/en/

INTERACTIONS BETWEEN BEEKEEPING AND LIVESTOCK FARMING SYSTEMS IN AGROPASTORAL LANDSCAPES: A CASE STUDY IN THE SOUTHERN MASSIF CENTRAL, FRANCE

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From columns to "save the bees" to calls to "conciliate beekeeping and agriculture", agriculture is often pointed out as responsible for pollinators decline and the beekeeping sector difficulties. At the same time, agriculture, as a major factor of landscape constitution, is an unavoidable lever to solve these very issues, namely through the floral resources it shapes. However, knowledge about the impact of agropastoral farming systems on floral resources for beekeeping is still scarce. How do various livestock farming system contribute to the construction of floral resources in agropastoral landscapes? What are the consequences of this construction for various beekeeping-farming systems? In order to answer these questions, we led an agrarian diagnostic in a middle mountain massif of southern France. We identified various livestock farming systems and beekeeping farming systems, and their respective impact on and dependence to floral resources. This led us to reveal livestock-beekeeping farming systems technical-economical interactions at various spatio-temporal scales:

- cultivation practices (choose of cropped species, irrigation, fertilization, mowing) in the short term,
- "open" landscapes maintenance in the medium term
- land intensification and land abandonment in the long term

Beekeeping farming systems have adapted to changes in floral resources and to the global changing beekeeping conditions. They did so by adapting their uses of traditional floral resources or by shifting to new ones. Accounting for floral resources and beekeeping farming systems dynamics is helpful to inform agropastoral landscapes management, in order to elicit beekeepers and farmers' cohabitation.

THE HEARTLAND PROJECT: ONE HEALTH FROM SOIL TO SOCIETY

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Livestock farming is increasingly in the spotlight because of its impacts on the environment and human health. Global livestock production, specifically ruminant farming, has been associated with land use change, methane emissions, climate change, deforestation and biodiversity loss. At the same time, consumption of livestock proteins exceeds total human protein requirements for a healthy diet in most European Member States. However, ruminants can convert biomass unsuitable for direct human consumption (e.g. grass resources) into valuable food, including essential macro and micro-nutrients for humans. While grazing, ruminants contribute to: maintaining the landscape and, in specific local conditions, to; enhancing biodiversity and increasing carbon sequestration. The contemporary industry challenge is therefore to develop livestock production systems that simultaneously enhance environmental sustainability and support a healthy diet. This is a knowledge-intensive process. Therefore, this European Industrial Doctorate programme called HEARTLAND will connect one of the most notable industry to the cutting-edge scientific knowledge while maximising the impact of the programme by working closely with experts in communication (to multiple audiences) and dissemination (to potential end-users). HeartLand systems and component research will take place at the Devenish Lands at Dowth. This is within the Brú na Bóinne UNESCO World Heritage Site and a unique research site as it is located in the presence of significant monuments built by farmers. Throughout its history it has been maintained as a single large landholding for many centuries which allows us to look at the remains left by farmers. As such, Dowth represents the evolution of farming over 6,000 years in a single holding. HeartLand component research will also take place at University College Dublin's Lyons Farm Estate. The component research comprises 4 sward treatments (perennial rye grass, permanent pasture and two different multi-sward mixtures), with different establishment methods, fertiliser inputs and quantities of nitrogen. The systems research will take place with four different sward treatments under cattle and sheep co-grazing. The Functional Land Management framework and identify the criteria required to delineate the extent of the catchment / community in which HeartLand is embedded for Catchment Challenge workshops. The efficacy and efficiency of various farm management in delivering nutritious food and ecosystem services will be assessed with FarmDESIGN software using the results of the component and systems experiments.

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