First Agroecology Europe Forum

Fostering synergies between movement, science and practice

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Abstracts of talks and posters

Table of contents

NB: All abstracts are listed by alphabetical order of main author's family name.

Democratise Agriculture and Food Knowledge for Agroecology and Food Sovereignty

ANDERSON Colin, DAVIS Lynne, PIMBERT Michel, MAUGHAN Chris

Learning, education and knowledge sharing are central to expanding the practical and political aspects of agroecology, food sovereignty and the autonomy of food producers in Europe.

We need Research, Knowledge and Innovation directly oriented to nourishing people with food that is nutritious and culturally appropriate, protecting the environment, promoting public rather than private knowledge, stimulating job creation over intensifying capital and promoting democracy. This poster is based on collaborative reflection and action research carried out in a partnership between the Euroepan Coordination of Via Campesina and the Centre for Agroecology, Water and Resilience.

Mainstream Research, Knowledge and Innovation Systems currently undermine agroecology and food sovereignty. We must challenge…

1) Institutions: The privatisation of research, the close connections between research and corporate interests, and the exclusion of farmers and civil society from priority setting and decisions on research and funding.
2) Culture: The practices, attitudes and institutional incentive structures which encourage professional researchers to dismiss 'non-scientific' knowledge, to privatize research outcomes and to relate to farmers and communities in extractive ways.

We need to support knowledge processes, research and institutions that…

Support Autonomous Research
There is much knowledge generated in fields, CSAs, markets, farmer organizations and civil society organisations. This knowledge and innovation is essential to the development of sustainable food systems that work for people but is largely unrecognized and takes place outside of formal institutions. It is self-organized, citizen-led and often *develops processes and connections that scientists are not taking into account in their linear frameworks. It includes values outside the market economy and socio-cultural norms embedded in local communities.*

Includes farmers and civil society in setting priorities and public funding.
Publically funded research and innovation institutions (e.g. E.U Horizon 2020) need *need to allow for the equal participation of citizens and food producers through collective agenda and priority setting that serves the public interest.*

Creates a Dialogues of Knowledges
In order to tackle many of *the complex and interlinked environmental and social challenges that underlie our current food crisis,* we must build trust between people with different perspectives. New knowledge, innovation and social change are most effective when based on dialogue of knowledges. The knowledge of professional researchers should be able combined with the knowledges of farmers, fisherfolk, pastoralists, indigenous peoples; and small businesses and civil society groups.

Builds networks

To scale-out and amplify agroecology and food Sovereignty in Europe, research and knowledge processes are most effective when based on and further develop networks that enable a dialogue of knowledges and collective action.

For more information visit: www.eurovia.org, www.peoplesknowledge.org or www.agroecologynow.com

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A social experiment on an experimental farm station : exchanging and sharing knowledge and experiences to support the agro-ecological transition toward more autonomous farming systems

ANGLADE Juliette

Experimental farm station may become privileged places to support agroecological transition by opening their doors to create a space for a concrete and sensible dialogue, and foster a greater articulation and circulation of multiple forms of knowledge.

The agroecological transition is embedded in the lexical field of worlds of the unavoidable, the imperative, the future, but few places are dedicated to give it a flesh and concrete existence, a « tried-and-true » guarantee. The INRA experimental farm station of Mirecourt (Vosges, eastern France) is trying to do so by opening the doors to a large audience of their autonomous mixed-crop dairy system experiment, entirely certified on its 240 ha in organic farming since 2004. For 10 years, between 700 and 800 visitors (students in technical and higher education, farmers, and AKIS actors) coming mainly from the Eastern part of France but also from other regions of France and Belgium, were received each year, corresponding to about 20-25 days/yr. It is less conventional farm visits or information days about research trials, and more days of exchanges and share of multiple forms of knowledge, know-how and experiences, to support a transition toward more autonomous farming systems.

Since 2016, the knowledge exchange days are the subject of a social experiment aiming to depict, by the INRA practitioners themselves, a pragmatic research, a science in the making, living, uneven, humble to restitute complexities, variabilities and uncertainties inherent to autonomous agricultural systems that do not without but do with the environment.

The device has allowed to try many modes for knowledge-sharing, varying situations to reflect environmental and work conditions (fields, nearby animals, the parlour …) and facilitating dialogue and debate with different discussion partners bearers of specific knowledge, and professional and ethical standards. Participants describe action routines or exceptional experiences, track records, experimental results, visions, or whether change in attitudes, by the means of different media that speak for themselves: storytelling, photos, facts and figures, graphs, markers, indicators from everyday life … Focus are, more often on the process than on the results that are site-specific, and on the "doing" as many as the "thinking". Intellectual, social, technical and material pathways are maid visible and reveal unresolved issues, difficulties, mistakes and unexpected levers, seen as potentially useful resources for practitioners looking for more autonomy.

In the pedagogy field, the issue involved here is to foster the inter-comprehension, to build a collective negotiation on the coherence of the scientific and pragmatic choices and of the meanings of results to contribute to an active appropriation and an informed criticism on urgent societal issues. In this regard, experiential learning and socio-cognitive conflicts are encouraged by maximising times for peer exchanges in small groups and learning in context, with a particular attention given to observation, and more broadly to a sensitive environment.

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Agroecology Hungary: Networking Facility for Hungarian professionals

BALÁZS Katalin, PODMANICZKY László, TÓTH Péter

The rural countryside has always been more than a space for simply producing for the market. Beyond producing food and fibre, the rural economy and activities always have had an effect on the formation of the landscape, biological resources, influenced culture and provided work and livelihoods for people in the countryside and rural communities. The multifunctionality of agriculture, which was built upon thousand years' of experiences shall not be overlooked. The rural economy is not simply a biological industry. Its sustainability can only be assured if efforts to improve production and economic performance are carried out with due consideration to their environmental and social effects. We need sustainable agriculture systems, environmental and landscape management which provides, residues-free, healthy and safe food products and other raw materials while also preserving our soils, drinking water reserves, wildlife, landscapes, people and their communities.

The so called eco-functions play increasingly important role in farming. Eco-functions of farming cover environmental considerations in a wider sense, which shall be taken into account in any type of farming systems. It is obvious that the joint provision of environmental safety and food safety (that are increasingly emphasized by the EU policies) can only be realized by choosing the right farming method/practices and intensity that are most appropriate to the environmental conditions. The environmental/ecological functions of farming lead far beyond the framework of land management and economic agricultural production, in fact, farming maintains a large part of our environment which provide a crucial pillar of our quality of life.

Considering environmental aspects in farming do not only appear as a problem affecting some areas, but are actually form the basis of a new type of farming concept: producing more and better in another way. The background for this is the expected rapid general expansion in the demand for agricultural products in the next few decades. This is basically explained by two reasons: firstly, the increasing pace of global population growth, on the other hand the improvement of the population's solvency. More and more people think that the growing demand for food can no longer be satisfied with the usual farming methods, at least in no way without serious environmental damage (mainly due to rising artificial input uses). Instead, ecological intensification and agroecology are seen as solutions to satisfy both the growing needs for food and the maintenance of the quality of the environment. The essence of this idea is to optimize the supply, control and support ecosystem service functions in order to produce agricultural products. According to this concept diverse, multi-enterprise, landscape scale production structures and management can ensure the environmental, ecological flexibility while at the same time provide increasing quantities of food.

Agroecology Network Hungary is a new association, a professional platform for agronomists, social scientists, economists, ecologists, conscious consumers and practitioners. Our mission is to

- explore the environmental, economic and social aspects of multifunctional agriculture, to encourage the development of agro-ecological farming systems which perform equally well across these domains
- assist agriculture and rural communities through practice oriented high-quality research, development and practical outreach, policy advisory work, in the field of

sustainable environmental and landscape management to promote agro-ecological farming systems and also assist establishing policies for sustainable landscapes and benign living spaces,

- share, exchange and convey knowledge about these systems of the highest quality within our country and beyond.

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Can we avoid extractivism while doing research in agroecology? A critical view on co-optation and institutionalisation of agroecology

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Agroecology is being co-opted and researchers in agroecology need to be aware that they can drive that co-optation or choose to carefully explore how their work can contribute to enhance people's capacity to define and transform their territories.

Agroecology is born out of the convergence of territorialised peasant practices and social movements contesting the extractivism in which world agriculture has become trapped and that has proven to lead to growing socio-ecological inequality and injustice (Gimenez et al. 2013, Rosset and Martinez-Torres, 2015). Agroecology as a matter of fact is part of a larger social movement active in fields as divergent as energy, transport, health, living, education (Altieri and Nicholls, 2017). It can be seen as a "methodological strategy" (Guzman, 2011) in the "contestation, defence, (re)configuration and transformation of contested rural spaces into peasant territories" (Rosset and Martinez-Torres, 2013, 1). To effectively activate this social transformation, agroecology proposes a toolbox which is entirely different than the institutions, strategies and tactics of the corporate food regime.

In a context of civilizational crisis, the agro-industrial food system and its extractive industries are continuously restructuring themselves to continue along the same path. Agroecology has become of wide interest and forces are at work to counteract agroecology's transformative capacity by reducing it to merely a set of techniques. Indeed following its own path dependence, the extractive economy is swallowing agroecology as "just another tool of the same toolbox", by co-opting it. Peasants and rural communities are stripped of their resources and knowledge to be incorporated into the globalised market (Giraldo and Rosset, 2016). Public institutions governing agriculture around the world actively contribute to the institutionalization of agroecology. Recent examples are the International Symposium on Agroecology for Food Security and Nutrition organised in 2014 by the FAO (FAO, 2015) or the "Agro-ecological plan" launched in 2014 by the French Ministry of Agriculture" (Ministère de l'Agriculture, de l'Agroalimentaire et de la Forêt, 2013). In both these initiatives, agroecology is seen as one of the options to be promoted and supported, at the same level as "sustainable intensification", "climate smart farming" or GMO's. This co-optation and institutionalisation has been criticised by social movements and researchers (Giraldo and Rosset, 2016; Collectif pour une agroécologie paysanne, 2014; Holt-Giménez and Altieri, 2013). While they acknowledge political opportunities offered by the opening of a debate space within public institutions and upscaling of agroecology, these authors do not want it to be stripped of its critical and transformative dimension. To put it simply, we are facing today two confronting visions of agroecology: institutional agroecology versus peasant agroecology.

In our presentation we will argue that in Belgium, we are also starting to witness the co-optation of agroecology. During the last year, we have identified 3 examples of this: i) the growing enthusiasm of wealthy landowners for agroecological techniques, developing a parallel network and largely broadcasted projects; ii) the advocacy for genetic engineering techniques such as cisgenesis and CRISPR as tools of agroecology by

GMO promoters; iii) the set-up of an interuniversity Master in Agroecology. These examples all have in common first that they lack the social movement dimension of agroecology if considered as a movement, a practice and a science (Wezel et. al 2011). Second, they do not question fundamental values underlying the extractive logics of the industrial food system. Instead they perpetuate some of the principles that peasant agroecology contests: the ongoing concentration of land and infrastructure with desactivation of farmers as a result, seed patenting or technoscience-based and top-down solutions (GMO's, precision farming), or a pick and choose menu of courses around rather than in agroecology in the new Master. Neither do they question the "dominant" and extractive position of the advisor or researcher towards farmers, widespread in conventional science (agronomy in particular). This creates tensions between "conform versus transform" roles of agroecology which have already been evidenced in other European research arenas (Levidow et al, 2014).

This last issue is of particular interest to us. As a young research group at the University of Brussels, we are involved in several research projects and other initiatives that aim to push forward agroecology in Belgium. We explore different forms of collaboration between researchers, farmers and other practitioners. We no longer seek to integrate practitioners' knowledge to scientific thought through diverse forms of 'participatory research'. We rather seek to contribute to the empowerment of farm-led forms of socio-technical organization, which highlight the crucial role of farmers' decision-making (Louah et al., 2015). We also explore how to enhance people's capacities to define and shape their food systems. We experiment reflexive methodologies in our search to avoid the reproduction of extractive logics. And yet, we are confronted with a number of questions in relation to our own position and role within the agroecological movement. In particular we question the alliances to forge, positions to take, activities to get involved in and choices to make to avoid our work servicing the reproduction of extractivism. We are also concerned about endangering agroecological initiatives by overexposing them, including the peasant families developing them. In a nutshell, we are facing the dilemma of how to effectively operate this positioning reversal and still comply with demands of the current academic research system (which obeys to extractive logics as well).

In our presentation, we will focus on critically reflecting on the different research processes we are involved in and outlining questions raised. We will also propose a research agenda to answer these questions.

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A "research-embedded-in-action" framework to foster agroecology (Adopting an integrated approach centred around farming and farmers)

BERTAGLIA Marco

Better integration of policy-making, research and actual work in the field, but mainly focusing on work on the farms, can broaden the diffusion of agroecology.

Many examples exist of policy initiatives, research projects, as well as real-life endeavours, which contribute to facets of what agroecology and a sustainable society could look like. We increasingly see holistic approaches in all three aspects. Yet, there is still a need to strengthen integrated action and overcome obstacles to broader diffusion of agroecology. This oral presentation is exploratory in nature and intends to open a debate, offering signposts for action. It presents the characteristics of both established and novel research / policy interfaces. It sketches a framework for action aiming to break the silos of policy / science / practice. Showing brief examples of an existing project and developing on potential future proposals, it launches an invitation to Agroecology Europe to set up a mixed steering group of scientists, policy-makers, farmers and other practitioners, with the aim to bring to life one (or several) "radical-sustainability" agroecological farms in Europe. It encourages a collective reflection on the political, social, legal and financial frameworks that could foster the development of this type of projects / networks / tangible realisations.

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The local committee for sustainable food in Lyon

BESSON Dounia

Dounia Besson, deputy mayor of Lyon, is responsible for social economics and sustainable development. Lyon is especially engaged for sustainable food's democratisation. It was the only French city involved in an Urbact network on this subject, and the first who creates a Food Policy Council in France. Its politic about responsible consuming includes the development of community gardens, especially in the poorest areas of the city. Nowadays, about 2 000 people are responsible for 45 gardens. Citizens create 3 or 4 new gardens a year, in partnership with the municipality. Those places are helping to feed people, but they are first creating better social relationships. A garden is a meeting place for every generation, for people with different backgrounds and cultures. It's an opportunity to talk about food, wellness, health, sustainable development… The gardeners are managing the project through an association, which becomes an empowerment tool. Dounia Besson decided to develop permaculture's training for the gardeners, in partnership with the local community gardens network: le Passe-Jardins. With the help of the Lyon 2 University, Dounia Besson hopes to develop a better understanding of the permacultural practices development and of its effects as a holistic approach of gardening.

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The use of emergence traps for sampling overwintering beneficial insects

BLAIX Cian, MOONEN Anna-Camilla

Overwintering insects can be sampled using inexpensive emergence traps

Sampling of beneficial insects is often performed during their active period in agroecosystems. However, information on beneficial insect overwintering behaviour and habitat preferences can be useful for the management of these systems to enhance the ecosystem services that these insects can provide.

There are two predominant means of sampling overwintering insects; soil sampling and emergence sampling. Soil sampling often involves collecting specimens of juvenile and pupae development stages. This can be problematic for species identification. In the case where identification at the species level is possible, the larvae and pupae can be extracted from the soil sample by, for example, sieving the sample or using floatation techniques, and subsequently identified (Southwood & Henderson, 2000). Otherwise, the soil sample can be placed in a cage or the larvae and pupae can be extracted and left in rearing chambers until the specimens reach adulthood (Raspi *et al*., 2007; Schaffers *et al*., 2012).

Emergence traps are a popular alternative to soil sampling. They take many different forms and shapes depending on the habitat and the organisms being sampled. A common type of emergence trap used is the modified malaise traps which consist of a net forming a tent-like structure over the sampling area. A collecting bottle is attached at the top of the structure and they can also contain a pitfall trap to collect epigeal organisms (Sarthou *et al*., 2014; Sutter *et al*., 2017).

A survey of overwintering hoverflies was organised in an organic farm in Tuscany, Italy. Emergence traps were used as to facilitate species identification by using adult specimens. A total of 104 "homemade" traps were set. Each trap consisted of a hula-hoop encircling three bamboo sticks, forming a tent-like structure which was covered with netting. Sticky traps were used to collect hoverflies as opposed to collecting bottles. This was due to constraints regarding the transportation of equipment.

Due to with wild boar and deer attacking the traps, the trial was unsuccessful. This highlights the advantage of soil sampling in areas with a high density of large mammals. If the risk of the traps being damaged is lower but still present, the method used in the survey would be suitable as the traps can be fixed or replaced with relative ease and at a low cost. The use of modified malaise traps would be ill advised when wild mammals are present as the cost of replacing a trap is quite high.

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The crucial contribute of bionomics to agroecology

BOCCHI Stefano, INGEGNOLI Vittorio

From Landscape Ecology to Landscape Bionomics

Agroecology is based on the ecological knowledge applied to the governance of agricultural systems, first of all trying to minimize external inputs. Anyway, as affirmed by Bocchi and Gliessman, agroecology must be trans-disciplinary and have to consider the entire complex system of a territory, studying and designing the agricultural landscape and its "ecosystem services". This because the inversion of historical tendencies: today agricultural land uses predominate in a landscape, making natural habitats the patches that are dispersed over much of the Earth's land surface! So, we must carry out agricultural production so that it works with rather than against Nature.

But limits due to the old scientific paradigm lead to a near sterile capacity to develop complete studies on agroecology. The problem is that, today, agroecology is linked to conventional ecology and following this vision it is impossible to evaluate the complex system state of an agricultural landscape. We would have to pass from the old and ambiguous concept of ecosystem to the new one of ecotissue, from the concept of 'stability through constancy' to 'stability through change', from reductionist parameters (e.g. LAI) to systemic one (e.g. BTC). Remember that cultivations are linked with food and health; diet is, in reverse, linked with the environment too. Cultivations and seeds heterogeneity are known to be linked with immune system, microbiota exchange is linked with the brain, etc. Moreover, Human health defence cannot be only related to pollution, it has to be related to environmental dysfunctions, etc.

Therefore, we need updating general Ecology with the new discipline of Bionomics. When related to the landscape, "Landscape Bionomics" (a) recognizes 'ecological units' of the territory as living entities composed by a complex integration of natural and human systems and (b) studies its physiology and pathology through a quali-quantitative clinical-diagnostic approach, as stated by Ingegnoli. Landscape Bionomics upgrading to ecology is impressive. For instance, let us present a crucial function, the BTC, bionomics territorial capacity of vegetation [Mcal/m2/year], evaluating the flux of energy able to maintain the order reached by a complex ecological system.

Since 1900 to 2010 the emerged Lands passed from 50.05 to 40.25 x 106 km2 (-19.58%) of forest cover. These values are not correct, because we changed not only the surface but even the bionomics state of the phytocoenosis: we passed also form an average of 7.00 to 6.40 Mcal/m2/year, thus the decrease results -26.47%! In the same period, the agricultural land increased from 11.6% to 13.42%, so +15.69%, but the average BTC of emerged Lands decreased from 2.95 to 2.21 Mcal/m2/year; so the influence of productive BTC on the average world continental BTC increased of +44.40%!

Any type of agricultural and rural landscape is becoming more and more important to the survival of the entire bio-eco-geosphere. We are in a period of climate change, and man has a wide responsibility, not only for the increase of CO2. Gaia's response to adverse change is driven by: (1) the changes in the whole forest bio-ecosystems (primary relevance) and (2) the changes in marine algal patches, as demonstrated by Lovelock. The land surface of the Earth has evolved as the site for 'ecosystems' that

serve the metabolism of the Earth, like forests, and they are today dangerously weakened by farmland governance.

The preeminent importance of ecological services are the protective functions (PRT) possible only at landscape unit level, but if we make a balance of BTC flux (based on its mean value in a given time), we can see that in 1900 the forest was the most large component of emerged Lands surface, with a capacity of balance "transformation deficit" of about 220 x 1018 cal/year. Today (2010) the forest are not the largest component of world landscapes and their PRT capacity is reduced to 169 x 1018 cal/year, -23.18%, while we need much more capacity than one century ago, because of the growing ecological crisis and climate change.

In summary, we must upgrade traditional Ecology with the new discipline of Bionomics. We must rehabilitate agricultural systems considering agroecology in the sense of agro-bionomics, therefore given absolute priority to agricultural landscape control and design even before (paradox) the capacity of minimize external inputs.

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Improving the dairy farm efficiency with the milk Carbon Footprint assessment

BROCAS Catherine, BLONDEL Anne

A farm with a lower carbon footprint is a more efficient farm and if it is more efficient it is more profitable.

Agriculture is responsible for greenhouse gases (GHG) emissions, particularly methane and nitrous oxide. In France, agriculture sector is contributing to 18% of national GHG emissions and 8% come from ruminants considering methane and nitrous oxide from animals and manure management. Regarding the global objectives on climate change, French government's targets to cut GHG emissions by 75% by 2050 compared to 1990. In agriculture, the national low carbon strategy aims to cut GHG emissions by 12% below 2013 levels by 2028. Moreover, consumers ask for more information on the environmental footprint of products and their influence on climate change. Meanwhile, dairy industry are enlarging their requirements for their suppliers, asking farmers to provide information about the impact of food production and specifically carbon footprint.

All these objectives represent a challenge and an opportunity for the dairy sector to highlight its current and future accomplishments. Although environmental drivers are not well received by farmers, evidences are available to illustrate that lower GHG emissions are associated with reduced operational costs. The French Livestock Institute (Institut de l'Elevage), in association with three partners, has launched the LIFE CARBON DAIRY project with the main objective to promote an approach allowing milk production to reduce the milk carbon footprint at farm level by 20% over 10 years. The three partners are key players in the French dairy sector i.e. dairy advisory enterprises such as ECEL, Chambers of agriculture and French dairy board (CNIEL). In order to reach the goal, project's partners developed a Life Cycle Assessment (LCA) tool named CAP'2ER® aiming at measuring the milk carbon footprint in dairy farms in France. Answering the LCA approach, the milk carbon footprint assessed in CAP'2ER® is covering the greenhouse gases (GHG) emissions to determine the Gross Carbon Footprint (GCF) and carbon sequestration to assess the Net Carbon Footprint (NCF). Applied on 3,316 farms representing various milk production systems in France, the project provides a good overview of the average national milk carbon footprint. In parallel, each individual evaluation gives management factors to farmers participating to identify opportunities of improving farm efficiency and reaching the carbon reduction target. Variations in GCF are explained by discrepancies in farm management. Practices with the largest impact on milk carbon footprint average are milk yield, age at first calving, quantity of concentrate, N-fertilizer used (organic and chemical) and fuel consumed.

The project show that it exist a difference of 30 €/1000 l between the lowest 10% milk carbon footprint and the highest 10%. This reinforces the fact that improving production efficiency and reducing the carbon footprint of milk production are highly complementary. It's why, the milk carbon footprint assessment is a good means to provide farmers with information about GHG emissions from dairy system, the link with farming practices and the way they can reach the environmental target.

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Traditional water meadows – a perfect management option to combine ecological and economical values

BUHK Constanze

Traditional irrigation techniques - once widespread in Europe – have great potential to combine ecological and economical values in the landscape.

Traditional meadow irrigation techniques were once widespread throughout Europe and served as a method of grassland intensification before the era of mineral fertilization. Close to Landau (Palatinate) there are several hectares of traditionally irrigated water meadows that are irrigated twice a year in parts since the medieval age or irrigation has been re-initiated in the 1980th. In our project "WasserWiesenWerte" we analysed the ecological, socioeconomical and economical value of the irrigated versus non irrigated extensively to semi-intensively used meadows. The results are very motivating. Biomass production increases by about 20 % along a fertilization gradient of 0 to 80 kg N /ha. At the same time, several species groups do not decrease in frequency and diversity in the meadows under irrigation. In contrast, some especially rare species seem to even profit. Ditch structures turn out to be especially important refuges for sensible meadow species and add a large quantity of additional species to the landscape diversity. We propose that the revitalization of traditional irrigation techniques should be considered when extensively managed grassland - especially hay meadows - are prone to either intensification or abandonment.

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Transition to agroforestry: current challenges and opportunities for the adoption of agroforestry as carbon sequestration strategy

BURBI Sara, OLAVE Rodrigo

In spite of the uncertainty in the relation between carbon assessment and economic modelling of agroforestry systems, the adoption of agroforestry can be promoted by engaging with farmers and land managers on the multiple benefits of these farming systems with the help of user-friendly decision-support tools that are tailored for the farm.

The multiple benefits of agroforestry include the provision of several ecosystem services, e.g. biodiversity, food, timber, mitigation of climate change and the risk of erosion and land degradation. Carbon sequestration from agroforestry systems is an important regulating ecosystem service. Data from several studies in Europe (Northern Ireland, England, Spain, Portugal) suggest that agroforestry has a great potential to sequester carbon, in some cases more than grassland (Olave, 2016; Fornara et al., 2017). However, adoption of agroforestry is facing challenges due to several factors influencing farmers and land managers decision-making. Similar to what was found in a recent British study on livestock farmers' attitudes to on-farm climate change mitigation strategies using a decision-support tool tailored for the sector (Burbi et al., 2016), the adoption to innovation to transition to climate friendly practices can encounter obstacles that are not always related to the evidence base to support the benefits of agroforestry. Barriers to innovation in the agroforestry sector include the uncertainty regarding carbon assessment methodologies. In particular, Land Use and Land Use Change from Forestry (LULUCF) accounting needs to better reflect the full potential for carbon sequestration from agroforestry systems using comprehensive calculations. Economic modelling is also a key aspect in promoting agroforestry, as one of the greatest barriers to innovation is the uncertainty in finance and labour required in an agroforestry system. This is particularly important for researchers to consider when engaging in the promotion of agroforestry. Clear and transparent communication on the multiple benefits of a system should also include information on the trade-offs and the possibility of integration of agroforestry within the current legislative framework. On the one hand, future work needs to address the uncertainty in LULUCF accounting and refine current methodologies used to measure the carbon balance of the system. Agroforestry-adapted legislation is also needed to better reflect the importance of these systems in terms of climate change mitigation and their delivery of multiple environmental and socio-economic ecosystem services. On the other hand, decision-support tools need be adapted for agroforestry to highlight practices that are more suited for the landscape and the socio-economic context, helping farmers and land managers to easily identify the practices that provide greater carbon sequestration without compromising the productivity of their agri-businesses.

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Policy From Below for Food Sovereignty and Agroecology: The People's Food Policy Process in England

BUTTERLY Dee, ANDERSON Colin

The work of social movements to self-organise in autonomous processes to articulate both their collective vision and specific demands are critical for amplifying Agroecology and for achieving food sovereignty.

We live in a rapidly changing world with growing inequality and environmental destruction. Policy in all domains increasingly reflect the neoliberal agenda – one where profit and growth are viewed as ends in of themselves. People – their wellbeing, their relationship with nature and their humanity – are increasingly disregarded in decision making by elites. The case of food and agriculture is a case in point where policies are controlled largely by multinational corporations and financiers in the private sector along with their counterparts in science, government and mainstream NGOs.

Yet, it is not all doom and gloom. Social movements around the world are mobilising to contest the injustices of the current dominant order(s) and to build alternatives. The global food sovereignty movement reflects a call to put people and planet first and, through democratic reform, for food producers and those most affected by the injustices of the food system, to gain control over food policy and practice.

In different parts of the world, citizens are organizing grassroots processes to create people's food policy platforms to articulate the vision and policy demands from a food sovereignty perspective (e.g. in Canada, India, Australia). This talk will focus on England's *A People's Food Policy* process, which involved 18 months of dialogues, workshops and debates amongst grassroots organisations, NGOs, trade unions, community projects, small businesses and individuals. This people's policy process is embedded within a longer, ongoing, movement for food sovereignty in the UK. The resulting document was launched in June 2017, and is a manifesto demanding that governments, NGOs and people working on food policy put the wellbeing of people and environment first, develop integrated food policy, and create participatory decision-making approaches that empower those most affected by these policies. The document is now endorsed by over 100 organisations in the UK, creating an important platform to crystallise the argument for food sovereignty and to bring allies together around a common purpose. This poster will highlight some key points from a reflective and participatory evaluation of the PFP process to discuss the role of these grassroots policy-oriented processes in the struggle for Agroecology and food sovereignty.

Come visit the poster to pick up a copy of the summary document (while they last) or visit www.peoplesfoodpolicy.org to download the full report.

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Natural horticulture: Principles, techniques, and a case study

CAPPELLO Gian Carlo, BERTAGLIA Marco

Natural vegetable gardens that mimic nature enhance ecological status and soil biodiversity, producing high yields of all vegetable crops and promoting sustainability.

Natural horticulture mimics natural ecological processes and structures. It never envisages soil labour nor any sort of tillage. It does not disturb the soil in any way. It avoids using any kind of invasive technique to kill 'pests' or eliminate 'weeds'. Not only does it not use any pesticide or herbicide, it also does away with practices from organic farming that aim at getting rid of naturally occurring plants, insects or fungi. On the contrary, in natural horticulture, there are no such thing as 'pests', weeds', or similar 'enemies' to get rid of. These are all part of an ecosystem that can function well and provide services if the system is balanced and in harmony with the laws of ecology.

Techniques used involve trampling over grass, covering it with a thick (10 cm or more) mulch of possibly locally-grown hay, adding to biodiversity, then practicing the tiniest "nest" or hole, with the minimal soil disturbance possible, to plant seeds or seedlings. Mulch greatly increases water savings, reducing irrigation needs to a minimum, and buffers heat and water needs, and climatic extremes. A poster will display a summary of the techniques, signposting to further details, and showcase pictures from a case study.

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Ecofeminist perspective for a fair Agroecology: the case of Feminario in Andalusia, Spain

COSTANZO Mariagiulia

Ecofeminism is a philosophical and political perspective, a convergence between feminism and social ecology: whilst the first proposes gender equality, the second considers environmental problems. Ecofeminism analyses a new intellectual project that proposes a transformation of the reality through the rupture of classical dichotomies such as society/nature, man/woman, and production/reproduction (Zuluaga Sánchez, 2014).

An interesting example of ecofeminist proposal is the Feminario in the Universidad Rural Paulo Freire (URPF), Serranía de Ronda (Málaga, Andalusia), which is an educative project that supports agroecology attempting to work out an alternative model of rural development, beginning from his own peasant and territorial culture. In this background the Feminario emerges as a space of encounter and debate within the URPF. Starting from an ecofeminist perspective, the Feminario aims to make women visible and to highlight their role in the history of the rural culture, prioritizing sustainability and harmony with the territory.

Every year the Feminario organizes a meeting called *Feminist Rural Forum*, each year in a different place but never in a big city, always in a little rural village to achieve the visualization, putting emphasis on women and rurality and their role in the proposal of agroecological alternatives. The originality of the Feminario is to want to underline how is necessary to talk about rurality, criticizing an urban approach that sometimes has overshadowed rural initiatives. The Feminario aims to reconnect the rural and the urban beginning from the underestimated side, the rural one, showing how it is fundamental in building agroecological alternatives and in the construction of a fair and inclusive society.

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Cacao Forest: Innovating together for the sustainable cocoa of the future

COSTET Pierre

Cacao Forest - Innovating together for the sustainable cocoa of the future: innovating in the farms through bottom up, collaborative and multi-disciplinary methodologies, also connected to the renovation of the traditional value chains.

Cacao Forest is a pioneering project that brings together private and public sector actors to reinvent the way cocoa is grown.
It is clear that current cocoa farming methods are simply not sustainable. While the industry increasingly adopts intensive monocropping practices, small producers continue to struggle to make a living from cocoa. Not only this, but cocoa cultivation is also often associated with damaging effects on the environment, most notably through deforestation and the use of chemical fertilizers and pesticides.
We believe that to ensure the future of cocoa and the livelihoods of those work with it, we need to do things differently. By drawing upon local practices and knowledge, extensive scientific research, and the input of people all along cocoa and associated species' value chains, Cacao Forest aims to develop lasting agroforestry-based solutions that work for all involved.
Our goal is that these innovative agricultural models will:
• Improve the resilience of rural communities,
• Diversify producers' revenues
• Protect the environment
• Improve cocoa tree productivity
• Inspire the cocoa industry through being both productive and sustainable
We aim to achieve this by:
• Designing, testing and validating "efficient" cocoa-based agroforestry systems
• Identifying leaders among local farmers and farmer organizations who would be eager to scale up these systems
• Identifying and testing opportunities presented by complementary value chains.
The Cacao Forest team is made up of a unique cross-industry partnership between private companies, scientists, educators and end-consumers, working closely with producers and local experts. Our complementary priorities relate to cocoa production, such as ensuring sustainable family farming, preserving the diversity of cocoa varietals and improving cocoa quality. We draw upon these focusses, as well as our different areas of expertise and skill, to create the ambitious research and development program that is Cacao Forest.
We place innovation at the heart of our project, drawing on modern agroecology and agroforestry principles to inform our scientific activities, creating bottom up management structures, and working to disseminate the results of our research to as wide an audience as possible.
The project's scope and timeframe is very large, spanning six years and multiple cocoa growing regions. We launched in 2015 in the Dominican Republic and are planning to start in Latin America (Peru) in the near future.

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Multifunctional vs single-focus vegetative strips: Benefits and trade-offs in ecosystem service support

CRESSWELL Claire

Vegetative strips designed to support multiple ecosystem services offer floral support for pollinators, whilst also offering enhanced plant traits that protect water quality.

Agricultural intensification has reduced farmland habitat heterogeneity, farmland wildlife and some ecosystem services. Vegetative strips in field margins are widely-used to mitigate these losses. Sowing these strips with plant species with specific traits, such as large floral displays for pollinators or adventitious root systems for water quality protection, can restore support for these ecosystem services.

This study aims to increase the functionality of vegetative strips by delivering support for multiple ecosystem services within one plant mix in the face of reduced land availability and increased food production requirements.

We systematically collated evidence on how plant traits support specific ecosystem services. This evidence was used to develop seed mixes for multifunctional (pollination, bio-control & water quality protection) and single-focus (pollination or water quality protection) vegetative strips. The vegetative strips were sown in randomised-block field trials in April 2015. Floral and vegetative cover, plant species richness and plant height were surveyed monthly for 2.5 years. Root structural density was also sampled bi-annually. Repeated measures and two-way ANOVAs were used to analyse the data.

The multifunctional strip consistently had significantly higher species richness ($P<0.05$), floral support ($P<0.05$) and average plant height ($P<0.05$) when compared with the water quality protection strip. Vegetative cover was also significantly higher in 5 of the surveyed months ($P<0.05$) and no difference was seen between the strips for root structural density. Floral support varied over the study period when compared with the pollinator support strip, however it was significantly lower ($P<0.05$) between April and June 2017, likely due to competition from grasses.

These results suggest that when you include plant species with traits that support pollinators and natural enemies in a vegetative strip designed for water quality protection, you can improve support for all three ecosystem services.

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Involving farmers in measuring impact of agroecological farming systems

DAS Anshuman

A community monitoring tool, which encourages the farmer to participate in the collection, analysis and understanding the impact data of an agroecological farm, was the key to move a farm to a farming system.

Agroecology is closer to a natural system which imbibes the principles of nature – collaboration, recycling, multilayered arrangement, combination of various species/varieties and allowing succession. Sustainable Integrated Farming System (SIFS) project, among 9500 farms in India, Nepal and Bangladesh tried to promote agroecological farming by a) Altering cropping sequence through mixed/inter/relay cropping for collaboration and combination. Crop rotation for allowing succession and collaboration. b) Creating multi-layered space within a production system, so that collaboration and recycling are ensured. c) Enhancing subsystem diversity on farm, so that energy recycling and collaboration happens by default.

But, besides yield, nutrition and income, a family farmer harvests several other benefits from an agro-ecologically designed farm. So, a different set of parameters, capturing the social, ecological and ecological aspects were designed to capture impact, which were measured by the farmers themselves. Community monitoring is an already established way of tracking progress of any action and to do mid-term corrections. In addition, setting a target was always helpful for the farmers to ensure that they keep going in the right direction. Keeping this in mind, a tool based on the wheel diagram with 10 indicators, was developed to help small farmers following agroecological principles, to set their own target and monitor it. The Wheel helps in visualizing and comparing multiple ratings/scoring. The paper described the result of such exercise through 3 years with the farmers.

It was quite evident that, by building the capacities of the farmers to record and analyse different parameters or indicators, helped farmers positively in influencing their mindsets in moving towards more diversified farming systems from a highly focused monocropping of paddy. Those who maintained diaries, monitored their farm progress are continuing with the principles.

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University of Life Sciences (NMBU) and WHH.

Can combined food/non-food cropping systems facilitate transitions to agroecological systems in Europe?

DAUBER Jens

Non-food crops introduce new plat traits and new plant production practices to food cropping systems which may support sustainable and ecological intensification of agriculture in Europe.

Biodiversity, ecosystem functioning and regulating ecosystem services are declining in intensively managed agriculture in Europe. In response, guided by a strong focus on food security, land sparing concepts are debated as possible solutions.

Those go hand in hand with the food vs. energy (non-food) debate which is stimulated by an increasing competition for land resources and is following a food first approach, resulting in a spatial separation of food and non-food production.
A segregation of food production and biodiversity conservation and a segregation of food and non-food production respectively may both result in an even stronger dependence of the spared food cropping systems on external inputs (chemical plant protection and technology),

making those systems even less sustainable. An integration of non-food crops into food cropping systems may, in contrast, support a transition towards more sustainable cropping systems if the non-food crops would amend the cropping systems in a way that it

- provides more resources for organisms responsible for delivering regulating ecosystem services,
- sustains or increases soil fertility,
- decreases dis-services or puts services and dis-services into balance,
- becomes more adaptive or resilient to climate change,
- is socially desirable, and
- is economically viable and competitive in the long run.

The aim of this impulse is to discuss the potentials of combined food/non-food systems in Europe for transitions to agroecological systems.

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Agroecology Training and Learning For Solidarity: Building a Farmer-driven European Agroecology Knowledge Exchange Network

DAVIS Lynne

Learning, education and knowledge sharing are central to expanding the practical and political aspects of agroecology, food sovereignty and the autonomy of food producers in Europe.

This poster explains how the European Agroecology Knoweldge Eschange Network, coordinated by the European Coordination of La Via Campesina (ECVC), is working to implement the vision of agroecology outlined in the Nyeleni Declaration of the International Forum on Agroecology:

"The diverse knowledges and ways of knowing of our peoples are fundamental to agroecology. We develop our ways of knowing through dialogue among them (diálogo de saberes). Our learning processes are horizontal and peer-to-peer, based on popular education. They take place in our own training centers and territories (farmers teach farmers, fishers teach fishers, etc.), and are also intergenerational, with exchange of knowledge between youth and elders. Agroecology is developed through our own innovation, research, and crop and livestock selection and breeding."

For more information visit: www.eurovia.org

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N fertilizer value of anaerobically digested plant material: effects of substrate quality, digestion and application method

DE NOTARIS Chiara, SØRENSEN Peter, MØLLER Henrik Bjarne, ERIKSEN Jorgen

Background

Crop production in organic stockless systems is often limited by nitrogen (N) availability. Inclusion of perennial forage legumes in the rotation can be used to increase the N input. Anaerobic digestion of the biomass can provide additional benefits, with the production of biogas and the use of digestate as fertilizer. Multi-species mixtures can produce more biomass and increase biogas production, but the quality of the digestate should be tested. The aim of this experiment was to assess the N fertilizer replacement value (NFRV) of digestates obtained from different plant materials, with focus on the effect of substrate quality, digestion and test crop (with different application methods).

Material and methods

Three plant materials were used as substrates for anaerobic mono-digestion: 100% lucerne, under four cuts per year management (Lu4); a mixture of ryegrass, lucerne, chicory, plantain and caraway under four and two cuts management (Mix4, Mix2). Winter wheat (WW) was fertilized in spring with digestate from the three substrates (Lu4-D, Mix4-D, Mix2-D) by surface banding, at a rate of 120 kg N ha-1. Spring barley (SB) was fertilized prior to sowing with the three digestates plus the respective untreated silages (Lu4-U, Mix4-U, Mix2-U) by direct injection, at a rate of 80 kg N ha-1. Raw and digested cattle slurry (CS) was used as a reference. Characteristics of the organic materials are reported in Table 1. Additional plots were used to obtain N response curves to mineral N in total N yield, in order to calculate the NFRV, which was then expressed as % of the total applied N (%NFRV).

Table 1: Composition of untreated (U) and digested (D) silages and cattle slurry used in field experiment.

Material	DM (% of FM)	NDF (% of DM)	Tot N (% of DM)	NH4-N (% of tot N)
Lucerne 4 cut, U (Lu4-U)	17.2	33	4.88	23
Lucerne 4 cut, D (Lu4-D)	3.7	-	8.92	73
Mixture 4 cut, U (Mix4-U)	15.1	42	3.58	9
Mixture 4 cut, D (Mix4-D)	2.8	-	7.86	59
Mixture 2 cut, U (Mix2-U)	21.8	52	2.57	14
Mixture 2 cut, D (Mix2-D)	5.9	-	4.07	54
Cattle slurry, U (CS-U)	6.4	-	4.51	59
Cattle slurry, D (CS-D)	4.8	-	6.22	67

(DM: Dry Matter; NDF: Neutral Detergent Fiber)

Results

There was a significant effect of treatment (applied material) on %NFRV, which varied from 24 to 55% in WW and 24 to 86 % in SB (Figure 1). There was a significant difference between substrates, with Lu4 having the highest %NFRV and Mix2 the lowest, in both WW and SB. This reflected the initial characteristics of the substrates (Table 1): Lu4 had the lowest NDF (fibers) and the highest N content, while it was the opposite for Mix2. In SB, digestates had higher %NFRV than the respective silages (average 37 % increase), although the differences were not statistically significant. It should be noted that there was a higher N concentration in barley grains with Mix4-U and Mix2-U, if compared to any other treatment (data not shown). %NFRV was higher in SB than in

WW, reflecting the two different application methods used, with a high risk of ammonia loss after surface banding. Different timing of N uptake should also be considered.

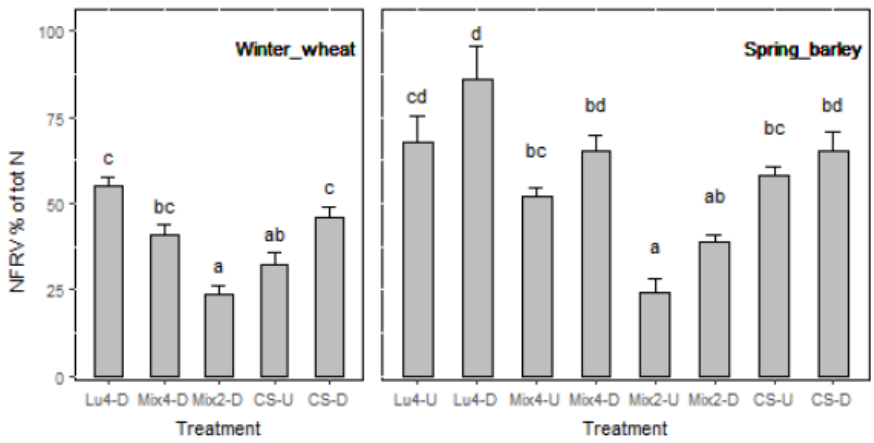

Figure 1: NFRV as percentage of the applied total N in winter wheat and spring barley, based on the total N yield. Bars indicate standard errors (n=4). Within each crop, different letters indicate a significant difference (P<0.05).

Conclusions

Anaerobic mono-digestion of plant material with different characteristics produced digestates with increased but variable N fertiliser value, depending on silage quality. Utilization of untreated silage as fertilizer resulted in delayed N mineralization and increased the barley grain N concentration. %NFRV was higher after injection to spring barley than after surface-banding in winter wheat. This was probably due to ammonia loss after surface-banding, thus application method and timing of plant N uptake should be considered carefully.

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Agroecosystem diversification: digging deeper

DEGRUNE Florine

Diversification of agro-ecosytems is likely to influence the soil biodiversity and associated ecosystem services with consequences for the overall performance of the agroecosystem.

Biodiversity loss has become a global concern as evidence accumulates that it weakens ecosystem services on which society depends. So far, most studies have focused on the ecological consequences of above-ground biodiversity loss but we still poorly understand whether and how the reduction of soil biodiversity has consequences for the overall performance of an ecosystem. This is of particular importance in agricultural systems given their importance for delivering food, feed and fibre, which directly depend on inherent supporting and regulating biotic processes.
Nevertheless, plants influence microbial diversity and community composition, and increasing levels of plant diversity in grasslands were shown to promote soil biodiversity. This implies that aboveground agro-ecosystem diversification in time or space (e.g. by crop rotation, intercropping, and use of cover crops) can be used to promote soil biodiversity. However, we lack knowledge of how above- and below-ground communities and the ecosystem processes that depend on them are linked, and how these interactions may subsidize primary production and other ecosystem services.
In the Biodiversa project "Agro-ecosystem diversification: digging deeper", we aim to unravel whether changes in aboveground biodiversity alter the relationship between soil biodiversity and ecosystem multi-functionality, and if innovative farming practices that increase plant diversity can be vehicles for optimising the simultaneous delivery of multiple beneficial soil ecosystem services. Our central hypothesis is that increased plant diversity in agro-ecosystems will promote below-ground biodiversity and related ecosystem services.
To test our hypothesis, we have selected field sites with an aboveground diversity gradient from low (many years of mono-culturing) to high agricultural diversity (grasslands and fields with crop rotation, intercropping or permanent vegetation cover). Our experiment is based on coordinated sampling campaigns to be conducted in five different countries including Sweden, Germany, Switzerland, France and Spain. In each country, 50 field sites will be selected resulting in a total of 250 fields across a North-South gradient in Europe. In addition to fields from farmers, field experiments covering a range of long- and short-term experiments with different levels of diversified crop rotations, cover crops, intercropping and reduced weed control will be integrated into the overall assessment.
The campaign of sampling is currently ongoing and preliminary results will be presented at the forum.

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Sociotechnical System Analysis of Weeding, Key Step for Designing Agro-ecological Systems at the Watershed Scale

DELLA ROSSA Pauline, MOTTES Charles, LE BAIL Marianne, CATTAN Philippe, JANNOYER Magalie

In Martinique (French West Indies) there is high pesticide pressure because of monoculture with high demand of farm inputs, linked to tropical conditions suitable to the growth of pathogens and weeds. This pressure cause high river pollution, in particular herbicides pollution which are the most used pesticides on this island. Thus, it is urgent to decrease the uses of herbicides at the watershed scale. Our work proposes a participatory methodology to design innovative agricultural systems decreasing herbicide pressure on the river. The watershed scale is a coherent level for actions reducing river pollution because of the integration of continuous hydrologic flows. However, watersheds, such as our study site, usually hold a high diversity of farms and cropping systems that are integrated into social, economic and environmental contexts. This is the reason why our question is how making a participatory process suited for designing innovative agricultural systems onto a heterogeneous territory, for a common purpose of reducing herbicides uses? We conducted an in depth analysis of the sociotechnical system of agriculture in Martinique, to highlight brakes and levers of innovations at the institutional level, and the different innovation strategies of actors. Locks of the dominant regime explained why we are currently in a weak agroecological modernisation process of agriculture, focused on the maximal efficiency of farms inputs and the reduction of negative impacts, instead of redesigning agricultural systems (diversification, mixed cropping, agroforestry, etc.). The analysis of the sociotechnical system allowed us to understand the mechanisms at different levels (markets institutions and regulations, agrofood chains, local networks, farmers knowledge and information services, etc.) that lock the system against radical innovation. We also showed the mechanisms of how innovation niches, from plot to regional institutions, can influence the dominant regime. This first step of our work allowed us to identify the main brakes to be reduced, the sources of local solutions for reducing herbicides and to choose pertinent actors for our participatory process. These results will be used to design together agricultural systems that are adapted to the socioeconomic context of our watershed.

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Farming novelties: our way forward

DELOBEL Vincent

Farms are unique spaces for novelty production

First, I'd like to describe our network of farmers and our organic dairy goat farm in particular (its history in brief, EU farming context, modern problems).

Second, I'd identify the many "areas of improvement" we are working on, and how we do it. I'd illustrate these novelties and issues we deal with, including grass management, specie association, organic & no-plough, plant evolutionary genetics, breeding for grass-feeding, artisanal processing of milk & grain, tree feeding, reducing our reliance on banks, balancing diversification & specialization, finding one's scale of production, transmission to youth and newcomers, relationships with markets, shops and supermarkets... I'd then formulate them as research and knowledge-needs in very practical terms.

Finally, I'd draw the sociological and political lessons we can draw from this reality, and pledge for a stronger recognition of our specific rights (land, seeds, health, income, water, etc.), including through an UN HR Declaration which would be long-term & universal guarantee of our freedoms (UN Declaration on Peasants' rights in project).

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Economic impact of feed autonomy and associated ecosystemic services in a Limousin cattle and poultry mixed farm in Belgium

FAUX Jacques

Feed autonomy can improve both farming's economic and environmental sustainability as well as the nutritional quality of beef meat, and thereby enables the transition of mixed farms toward agroecology.

The present study assessed the economic impact and associated ecosystemic services of increasing the level of feed autonomy of a livestock farm. It was conducted from 2013 to 2015 in the Ferme Saint-Michel, located in the loamy region of Belgium (province of Hainaut).

The Ferme Saint-Michel is a mixed farm producing Limousin beef cattle, poultry, and crops including winter wheat and sugar beet, in addition to permanent grasslands. In the nineties, the herd size and poultry production were increased together with the level of feed autonomy in order to get a higher value for cereals and to better control the quality of production. In 2009 protein pea was introduced in the crop rotation to substitute soybean used in animal feed. In 2015 the levels of feed autonomy were 99.2% and 82% respectively for cattle and poultry production. Since 2017 the beef production is certified organic. In line with the principle of feed autonomy, all the farm products are locally sold using short channels: all poultry are directly sold on the farm, while beef meat is sold either on the farm or through a local cooperative. Three specific questions were addressed to assess the performances of the production system.

The first research question aimed to determine the performances of different fodder crops in terms of yield (dry matter production per hectare), nutritional value (energy and protein contents), and cost price. Since feed autonomy largely relies on protein autonomy in our region, a particular attention was given to the protein content of fodder. Based on the protein content grazed pastures provided the richest fodder produced on farm for cattle, followed by the alfalfa-cocksfoot temporary grassland. In addition, the technical and economic performances of protein pea were characterized in order to increase the feed autonomy of poultry production.

The second research question aimed to determine how animals valorize the on-farm produced fodders. Different cases were studied: (i) growing and finishing young Limousin bulls on grazed pasture, (ii) winter growth of young bulls and heifers fed with rations including an alfalfa-cocksfoot hay or wilted silage, (iii) growing chickens using protein pea *vs.* soybean meal. In each of these three study cases, the on-farm produced rations appeared to be technically performant and economically profitable.

The third research question aimed to determine different ecosystemic services generated by increasing feed autonomy in a mixed farm, in addition to the production service. From an environmental point of view, the fixation of carbon in permanent grassland soils was highlighted. Also, using on-farm produced rations, characterized by a lower protein content, to grow chickens resulted in significantly lower nitrogen contents in manure and thus in lower nitrogen releases in the environment. Finally, the point of view of the consumers was considered: grass-based rations are known to provide nutritional quality to livestock products (milk, meat) in terms of fatty acids composition

and vitamin contents, in particular. Here, an increased content in polyunsaturated fatty acids (PUFAs) in beef meat with the length of grazing season was highlighted.

In conclusion feed autonomy enables the transition of livestock farms toward agroecology. Moreover, given the ecosystemic services that it provides, feed autonomy is favorable to the the societal acceptance of meat production.

This study was funded by the Direction Générale de l'Agriculture of the Service Public de Wallonie through a "Centre de référence et d'exprimentation" (CRE) agreement. The CRE agreements offer the opportunity to farmers to test their own research questions in their own farm.

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Les animaux sauvages et domestiques des alliés pour les hommes dans leur ferme

FAVÉ Marie-Christine

Dans les fermes en agroecologie, les animaux sauvages et domestiques, lorsqu'ils sont respectés et compris, devienennt des allies pour les humains.

Des animaux unicellulaires des sols, de la panse et intestins, aux vertébrés Mammifères des parcours et étables, en passant par les insectes et oiseaux ; sauvages ou domestiques, les animaux participent activement à la vie d'une ferme en agroécologie,, agriculture biologique ou durable qu'elle soit d'élevage ou orientée vers les cultures végétales (vignes, vergers, maraîchage). Ceci, en coopération avec l'homme et parfois à son insu.
L'animal est un être vivant, organisme individuel constitué de plusieurs milieux de vie intérieurs (le tube digestif, la peau, etc.) et vivant en immersion dans un milieu de vie environnement.

Chacun à sa place, exerçant son talent, l'animal donne le meilleur de lui-même, offre sa force de travail (animaux de traits et de bâts : cheval, mulet, bardot, âne, bœuf, dromadaire, lama…), son poil (crin, poils angora, soies), sa laine (mouton, lama, vigogne…), ses plumes ou duvet (canard, oies), son lait (vache, chèvre, brebis, jument, ânesse, chamelle …), sa viande, ses cornes, sabots et onglons (pour fabriquer des manches, des boutons, des objets d'arts…), ses os etc. et permet à l'éleveur d'être épanoui et de vivre de son travail, s'il vit dans un environnement équilibré.
Même si on a fait le choix du végétarisme, les animaux ont leur place et la relation avec les hommes a d'autant plus le temps de l'installer que la durée de vie de l'animal dans la ferme est longue.
Les animaux deviennent alors des sentinelles, des révélateurs, panseurs des déséquilibres individuels, du troupeau, de la ferme, en écho avec les autres êtres vivants (plantes, animaux, êtres-humains) qu'ils côtoient.
Connaitre leur mode d'expression permet à l'éleveur de répondre au plus juste à leurs besoins et réguler les déséquilibres, et de co-évoluer avec les animaux sauvages et domestiques.

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Impact of organic and conventional management and tillage operations on soil quality and productivity in a long term experiment

FERRETTI Lorenzo

Conventional systems are more productive than organic and there is not significant difference between plowing and reduced tillage operations; earthworms are more abundant under reduced tillage; roots density is higher in organic soils but phosphorous decreased by about 40% in 25 years.

My work was focused on the assessment of the impact of different management (organic and conventional) and tillage (plowing, chisel plowing, disk harrowing) options on soil quality. This assessment was conducted at Montepaldi farm within a long term experiment named MoLTE (Montepaldi Long Term Experiment, https://www.dispaa.unifi.it/vp-463-molte.html?newlang=eng) aimed to compare organic vs conventional systems.

The indicators used for the soil quality evaluation were:

- earthworms abundance;
- roots density;
- spade test;
- chemical analysis;
- yield

Crops:

- barley and sunflower

Period of sampling:

- indicators were collected from November 2015 to September 2017.

Main results:

- earthworms abundance: there was not significant difference between organic and conventional systems, except in one case (march 2016) in which earthworms in conventional systems were about 70% less than in organic systems. Concerning tillage earthworms abundance in conventional were about 85 % less than in organic systems;
- roots density: roots density in organic system were 20% higher than in conventional. There was not significant difference between tillage;
- spade test: there was not significant difference between both management systems and tillage;
- chemical analysis: in addition to phosphorous we estimated also organic matter and total nitrogen. There was not significant difference between these two parameters;
- yield: barley and sunflower in organic systems produced 30% less than in conventional systems and regarding tillage we could observe that in sunflower under reduced tillage produced 25% less than sunflower under plowing

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Weeds and field margins: the other side of the coin

GAIFAMI Tommaso

Weeds and field margins are usually perceived negatively by farmers but they have the potential to provide ecosystem services through their functional traits.

The main objective of my poster is to highlight and quantify the crucial role of herbaceous spontaneous species considered as weeds or at the field margin in providing ecosystem services.
Ecosystem services potentially provided by these species have been evaluated and then calculated through the following steps:

1. Selection of ecosystem functions: which role can play these species in providing ecosystem services such as erosion control, flooding prevention, supporting pollinators or biocontrol, cultural value, etc.

2. Identification of plant functional traits which might be responsible for ecosystem services provision: plants can provide a wide range of services evaluable through their functional traits.

3. Assigning a numerical value to each functional trait: in this way it is possible to quantify the role of species in providing selected ecosystem functions (1); For instance, for plants with fibrous root architecture will be assigned a higher score then tap root plants since they play a more important role in controlling soil erosion.

4. Calculating a resulting value for each plant species (*Functional Diversity Index*) taking into consideration all the ecosystem functions that it might provides: more suitable functional traits will result in higher functional diversity traits of each species;

5. Creation of a model that might be applicable to different agroecosystems

The resulting model is applied to a plant database which is the result of 25 years of data collection from a long term experiment (MoLTE) including two organic systems and one conventional system. Therefore, by summing up the *Functional Diversity* Index of each species composing the organic/conventional system, it is possible to compare the value of ecosystem functions provided by the two systems.

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The European organic movement: a pioneer of agroecology?

GALL Eric

The concept of "organic farming" dates back from the early 20th century. It combines visions of social reform movements and pioneer farmers who refused to use artificial fertilizers and synthetic pesticides, but were interested instead in concepts of soil fertility, nutrient cycling involving livestock and composts, food quality and health. The four principles of organic farming (health, ecology, fairness and care), codified decades later by IFOAM, and the actual practices of most organic farmers go far beyond the current legislation on organic farming as they exist in the EU or the US.

In the European context, organic farmers are to large extent forerunners and now a substantial part of the agroecological movement, sharing the same values and objectives. Both organic agriculture and agroecology promote a "closed system" approach which minimises external inputs; they use multiple and diverse crops and/or animals, and they rely on biological processes to build soil fertility and control pests and diseases. They also tend to favour more direct links with customers and to engage with social movements.

Just as organic farming contributes to agroecology with its production methods that have been tested in different regions of the world, agroecology adds new elements to organic production such as use of ecosystem services, high diversity of crops and varieties, integration of trees, (fodder) shrubs and hedges, focus on food and communities, food system perspective and access to markets, and integration of human knowledge and social capital.

In the research field, TP Organics, the European Technology Platform for organic food & farming research, has developed a vision for future research and innovation into organic food and farming, as well as agroecological systems in a broader sense. This vision is split into three themes: "empowerment of rural areas", "eco-functional intensification" and "food for health and wellbeing". Together, the topics proposed by the TP Organics Strategic Research Agenda will support the sustainable growth of the organic sector, while leveraging its contribution to sustainable food security and entrepreneurship in rural areas.

What could be learnt from agroecological farm practices and how could it be effectuated in the context of organic agriculture? How to ensure that organic agriculture and agroecology continue to support and to reinforce each other? Is "co-evolution" the right term or should the organic movement be recognised as a substantial part of the agroecology movement in Europe?

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Agroecological strategies for the dynamisation and revalorisation of the agrarian sector in Madrid region (Spain): Agrolab, open farming Laboratory

GARCÍA LLORENTE Marina

Open farming projects are an innovative social and nature-based solution that enhance the food system transition and contribute to reconnect human wellbeing with agroecosystem conservation.

We present a participatory action research initiative based on promoting agroecological practices, that takes place to revitalize the agricultural sector in Madrid, one of the largest cities of Spain with a significant metropolitan area and a suitable agrarian potential at rural and periurban areas. The experience is based on: (1) the promotion of training and entrepreneurship in the sector, (2) the creation of an agrarian network based on collaborative work with local communities and urban dwellers, (3) the promotion of social inclusion and equal opportunities based on social farming principles, (4) the valuation of farming ecosystem services, and ultimately (5) a transition towards sustainable models of production-commercialization and consumption.

This empirical case, constituted an action-research study where urban and urban dwellers are running two agrarian plots of 9000m2 following the principles of community management, social inclusion, agroecological production, and co-generation of knowledge and experience sharing. Since February 2015 the initiative had involved more than 75 participants, together with the support and monitoring of local farmers acting as monitors, local authorities and an agrarian research institute.

The communication describe the steps given during the period 2015-2017, the participants engagement, their characterization and the impact of the project in terms of their social network, professional skills, consumption patterns and the importance of farming activities (based on follow-up interviews). We also describe the hybrid model of governance of the project, including its up-scaling possibilities to create a network of open farming laboratories.

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In-field evaluation of a weeding robot targeted at agroecological farms

GARLANDA Lisa

The LettuceThink robot helps maintain weeds under control in small, agroecological farms.

Weeding is a key issue in organic agriculture, especially in agroecological farms as the use of chemical products goes against agroecology principles. One the one hand, theses small farms are not interesting targets for agricultural machinery companies. One the other hand, farmers say that the weeding process is one the most time-consuming task in the maintenance job. Weeding causes physical pain to the farmers, is labor intensive and is considered a very tedious task. A solution to this problem would be to use low-cost robots in farms to do the weeding part. Robots could weed by using techniques respectful of agroecological practices. Peter Hanappe and David Colliaux, researchers at the Sony CSL laboratory are creating a robot, called LettuceThink, that can weed mechanically beds of market gardening cultures. This robot can determine the location of the vegetable and weed around the plant thanks to an animated arm.
In this poster are presented the results of experiments created to put to test the efficiency of the robot. Efficiency is here defined as the ability of the robot to weed in the real conditions of use. Those conditions include the diversity of weeds existing in a market gardening farm, the diversity of cultivated plants and of weather conditions.

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Agroecological Network of Greece
For Agroecology as a Science, Practice and Movement in Greek

GKISAIKIS Vasileios

Presentation of the initiation of the Agroecological Network of Greece (Agroecology Greece)

The Agroecological Network of Greece (Agroecology Greece) started in early 2017 through the networking of agronomists, mainly researchers and trainers. It is an initiative for the promotion of agroecology as a science, practice and movement, in Greek. The Network is primarily focusing on agricultural sciences, extending to other scientific sectors, as well as to social & economic issues. It seeks to familiarize the Greek scientific and rural sector with the agroecological approach and to pursue the transition of food production systems to a truly sustainable state. It considers that the Greek rural territory hugely possesses such transition dynamics, due to favorable characteristics like small-scale ownership, Mediterranean pedoclimatic conditions, traditional agricultural knowledge and rich agricultural diversity, which can provide robust adaptation of agroecological principles and practices.

Specifically, aims of the Agroecological Network of Greece are:
i) to network researchers and trainers, mainly related to the agricultural sector, for the exchange of knowledge and research results;
ii) to provide information on the topic of Agroecology in Greek;
iii) to produce and collect informative & training material;
iv) to organize respective events and
v) to network with relevant international networks & organizations.

Agroecology is perceived to be an emerging concept in the field of agricultural sciences and beyond, defined as the application of ecological concepts and principles for the design and management of truly sustainable food production systems. It has an interdisciplinary identity and a systemic approach based on the production of knowledge, while it tends towards a unifying, repetitive and holistic perspective. Agroecological principles embrace a wide range of practices and fields of application, holding significant synergies with other paradigms in the field of sustainable agriculture, that offer alternative structures to the predominant pattern and impact of industrial agriculture, such as organic and biodynamic farming, permaculture, as well as with the approaches of agroforestry and multifunctionality in agriculture. The basic concepts of agroecology are also consistent with the imperatives of food security & sovereignty and sustainability of rural areas, beholding a major potential role for increasing the resilience of agricultural ecosystems and communities to environmental and climate pressures.

For further information please visit the web-platform www.agroecology.gr, providing all relevant information, material and contact & networking details.

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SEGAE Project: developing a serious game for agroecology training

GODINOT Olivier

The SEGAE project (SErious Game in AgroEcology) is aimed at developing a computer game for students and professionnals, in order to help them reach a systemic and multidisciplinary vision of agroecological farming.

European agriculture is facing many challenges, among which producing food and non-food products in sufficient quantity and quality and generating benefits for farmers and food chain actors, while reducing agricultural impacts on the environment. Agroecology, defined here as "the study of the interactions between plants, animals, humans and the environment within agricultural systems", is seen as a very pertinent option to reorient European agriculture in order to answer these major challenges.
However, higher education in European Universities is not yet fully adapted to train the present and future agricultural professionals on agroecology. In particular, multidisciplinary approaches are not very developed in existing programs. Moreover, current pedagogical methods often lack interactive and digital dimensions that are promising learning methods. Innovative tools are thus urgently needed to help university teachers deliver multidisciplinary, high quality and attractive training on agroecology to the students and current agricultural professionals.
The SEGAE project (SErious Game in AgroEcology) thus aims at facilitating a multidisciplinary and systemic understanding of agroecology for secondary and higher education students as well as agricultural professionals through the development of a digital training tool. This tool will take the form of a serious game, i.e. a computer simulation game that will help students and agricultural professionals understand concretely how to implement agroecological practices on a virtual farm, and evaluate the impacts of their choices on the economic, social and environmental dimensions of the farm.
A typical dairy and crop farm will be developed for each partner country, which will lead to 4 different farms (Belgium, France, Italy, Poland), thus providing a large variety of pedagogical activities and players experience. Several game modes will be accessible to answer different learning outcomes and to reach different publics. The game will include learning tools, factsheets and other information to help learners taking decisions on their virtual farm. A tutorial, pedagogical guide and online course will also be developed to help teachers integrate the game in their lessons. The game, tutorial and pedagogical tools will be freely accessible online at the end of the project and proposed in five languages.

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Endogenous emancipation of young peasants

GORIS Margriet, VAN DEN BERG Leonardo, BOTELHO Izabel

It's time to visiblize prejudices on peasantry, the ecological and cultural basis of agroecology!

Young peasants across the globe have to overcome many challenges to establish their own farm, including access to land and dealing with dependencies that modern agriculture has created. They are also faced with societal discourses that consider peasantry as backwards. Overcoming these challenges is a process of self-emancipation and of conquering more autonomy in farming practices and within social movements. In particular, it involves a resignification of peasantry and a collective struggle for public policies for rural youth.

Resignification of peasantry, i.e. the process of giving new meaning to peasantry, has received little attention in literature. This paper explores resignification as an ongoing and long-standing process of making explicit and undoing peasantry from its negative connotations expressed in daily language, gestures, public policies, paintings, books and so on. This habitus is found to be a heritage of centuries of exploitation of peasants. At the same time, signification of peasantry has changed repeatively over time and resignification of peasantry allows to build on previous transformations.

This paper uses a action-research approach to explore the process of resignification of peasantry in a serie of 11 film workshops with youth organisations linked to the agroecological movement in Zona da Mata Mineira, Brasil. Recorded discussions during the making of scripts and editing of film-material reveal a process of endogenous emancipation amongst the young filmmakers. The performances of young peasants in the films indicate awareness of their situation and point out reproduction of, improvisation on, as well as rejection of existing practices. Young farmers have situated agency that is related to the local degree of self-organisation of rural youth, Afro-brazilians, and women and shown in the story-lines and scripts the young peasants produced.

Although the exclusion of young peasants in schools, churches and other public places in rural cities is a taboo according to the young peasants, several of their films touch upon this issue. Young peasants consider the agroecological movement as a way to include rural youth in broader society. In the youth meetings organized by young peasants and hosting some of the filmworkshops, young peasants strengthened their agency and redefined peasantry. Youth from rural cities also engaged in the meetings, showing that peasant agriculture need not only be for daughters and sons of peasants. Knowledge is not only transferred from generation to generation within families but also shared in workshops, rural schools, agricultural universities, and in exchange meetings (intercambios). In contrast to the intercambios for “adults”, where only farming practices were discussed, in the youth meetings people played football and followed workshops on climbing, dancing and to discuss gender issues. Young peasants thus extend the significance and practices of peasant agriculture and the agroecological movement and include and inform people both from within and without the movement.

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Co-designing a decision-support tool with farmers as the basis for collective action and participatory approach

GUILLAUME Mary

We studied economics performances on organic farming through a collective action and knowledge sharing mechanism by co-designing financial management tool with farmers.

To face the complexity of agroecological systems, participatory approach has been promoted in agricultural research. The benefits of such approach arise from the interaction between scientists' and farmers' knowledges. The challenge is therefore to set up a method that promotes collective action and fosters synergies between participants.

In order to conduct research on economics performances on organic farming, we established a collective action device with 11 farmers by working with them to co-design a decision-support tool.

The farmers had expressed the wish to make better use of their economic data. The starting point of the participatory process has been therefore the co-construction of a management tool. This collaboration between researchers and farmers led to the development of TresoGest, a user-friendly financial management tool adapted to a variety of farming systems. Farmer can use TresoGest to follow their production costs and their farm's overall financial performance. Beyond this individual use, TresoGest is associated to a collective approach. The economic outcomes obtained with TresoGest have been revealed to all farmers at a participatory focus group. At that meeting, farmers interpreted results together by exchanging views on the performances of their system and practices.

In our research, TresoGest has promoted knowledge interactions. Throughout the co-conception stage, researchers' computer skills and scientific view have been combined with farmers' practical expertise. By strengthening farmers' confidence and interest, it facilitated exchanges between farmers at the focus group stage.
TresoGest is not only reduced to a decision-support tool. It can be considered as a *sociotechnical object* that redefines participants' posture and makes the collective action and knowledge sharing possible.

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Agroecology processes in Colombia: Advances and challenges. The case of the National Network of Family Farming (Red Nacional de Agricultura Familiar, RENAF)

GUZMÁN Pedro

Agroecology processes in Colombia, the work and proposals from the National Network of Family Farming.

Agroecology can contribute to the creation of favorable conditions for people, communities and organizations to generate autonomy through sustainable projects that strengthen local social networks, to encourage cooperation and stimulate participation in solving structural problems from the territories. Unfortunately, there are still large processes of inequality, and the large-scale agro business system with strong state support shows numerous dysfunctionalities. It has been deteriorating ecosystems and jeopardized the permanence of communities in territories that have traditionally been theirs, making the availability of healthy food and the existence of inclusive and solidary economies difficult.

In Colombia, despite the high degree of concentration of land ownership, violence and the lack of necessary infrastructure in the countryside, family farming is significant. It produces about 79% of the food we consume, 80% of our farmers are farming families and about 30% are female heads of household. (Acevedo, 2016) Many of these family farmers are involved in agroecological processes. Nevertheless, producers or entrepreneurs who have obtained a certification from a company or entity recognized by the government, totally ignoring the existing examples of agroecology, can only use the term of organic food in Colombia.

In that context, what is required to respond effectively to the existing problems? What would be the strategies to support people to take advantage of mechanisms that will allow them to co-ordinate and strengthen their action? Should the Colombian Government promote agroecology and strengthen it through the connection with local markets? Or should it regulate its production like organic farming?

The multi-functionality of agriculture, and especially Agroecological Family Farming (Agricultura Familiar Agroecológica, AFA), is widely recognized for its positive economic, social and environmental effects. AFA contributes to local development, general employment in the countryside, promotes that people stay in their territories and are better prepared to mitigate the effects of climate change and natural disasters, and contributes to the achievement of food security, sovereignty and autonomy through its connection to local markets (CAN. 2011). Yet, there is little recognition and support from the local and national government.

Based on these conditions, our proposal from the National Network of Family Farming (RENAF in Spanish) seeks to promote, visualize and highlight the efforts of Agroecological Family Farming (AFA) and make a theoretical-practical contribution. Our intention is to visualize agroecology as a scientific and political paradigm, which provides important reflections for peace-building in Colombia.

The work of RENAF on agroecology consists in:

Working together with the Network of Researchers on Family Farming and Agroecology, a network of researchers from nine Colombian universities seeking to initially characterize and systematize AFA experiences in the country;

Strengthening and promoting local agroecological and peasant markets as part of a 5-year commitment, through which dialogue and alliances can be established between different initiatives, including members of RENAF, and short food supply chains are promoted.;

Finally, being politically engaged in the elaboration of a differentiated Public Policy for Family Farming that includes agroecology as a socio-cultural productive system that can contribute to a sustainable development in the territories with significant contributions to poverty reduction, the eradication of hunger, the promotion of responsible consumption, and some of the SDGs as part of the Agenda 2030.

Our interest is to socialize the progress of the work of the RENAF during the European Agroecological Forum.

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Practicing Agroecology in Vermont, 25 years of lessons learned on the farm

HAYDEN John

The Farm Between has evolved over 25 years to become a model of regenerative organic and agroecologically based farming in Vermont, U.S.A.

My presentation will focus on how we have developed an economically viable perennial polyculture farm while staying true to agroecological principles. The talk will cover how our successful production and marketing strategies have evolved through necessity, innovation, and trial and error over 25 years. It is the story of how a spent dairy farm with impoverished soils and very little biodiversity has become a carbon sequestering, water quality improving, biodiverse, wildlife and pollinator sanctuary as well as a model for healthy food production. Vermont is on the forefront of the agroecology movement in the U.S and I will share my insights on how that has happened and where I believe the movement is heading.

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Agroecological symbiosis (AES) for local, combined farming, food processing and energy production, and nutrient recycling

HELENIUS Juha, KOPPELMÄKI Kari, HAGOLANI-ALBOV Sophia, PARVIAINEN Tuure, VIRKKUNEN Elina

By agroecological symbiosis (AES) we refer to a model of arranging food production in the mode of industrial ecology and industrial symbiosis (Koppelmäki et al. 2016). Industrial ecology refers to a concept in which the use of energy and material flows are arranged to resemble those in natural ecosystems (Frosch ja Gallopolous 1989, Graedel 1996, Graedel & Allenby 1996). Deriving from this basic concept, industrial symbiosis Chertow (2000) refers to an arrangement in which the partner industries following the industrial ecology principle are in close physical proximity that allows for localized co-evolution and maximal energetic and material efficiency through it. In being localized, the AES also serve in healing the "metabolic rift" (MR), which is defined as an irreparable rift that affects all the interdependent process of biophysical and social metabolism (Foster 1999). We see AES as a social-biophysical model, which includes the social and ecological goals of closing MR. MR was originally conceived of as a social and cultural distancing, but has also been described as a biophysical phenomenon (McClintock 2010). The efforts to heal the rift constitutes a fundamental change to the socio- spatial arrangement of the rural landscape.
We have been contributing to co-creation of a pilot AES in Palopuro village, in city of Hyvinkää, Finland. In this AES, the three key agri-food industrial partners are a relatively big cereal farm of 400 ha, a bakery of size fitting to the scale of cereal production in the farm, and a local energy supplying company. Several satellite partners joined the AES during its creation in 2015-2017.

The core of the energy and material flows of the Palopuro AES is planned to become a biogas plant of dry fermentation type. The plant will have, as its main feedstock, silage from lays for which the farm allocates 20% of its arable area. These lays are of dual purpose. As the lays contain legumes for fixing nitrogen biologically, they produce all the nitrogen needed for the plant production in the AES. At the same time, the silage harvested from the lays creates a feedstock that is sufficient to make the AES a net producer of (bio)energy (Tuomisto & Helenius 2007). The above ground harvestable part of phytomass production, including the recyclable N, P, K and other plant nutrients in it, is recycled through the biogas plant: the digestate serves as fertilizer.

In broad analysis of sustainability, the AES seems to provide multiple positive outcomes, including economic and socio-cultural criteria (the latter: through localizing food production). In terms of ecological sustainability, the AES allows clear indicators for sustainable energy, and for sustainable nutrient flows and reduced nutrient loading. In addition, in the specific case of Palopuro AES, introduction of the bioenergy-biofertilizer leys to the otherwise monocultural cereal production increases rotational diversity, and contributes to biological diversity of the farm. The AES, by using organic fertilizers and leys in the rotation, turns the arable soil from a source of carbon to a sink of atmospheric carbon.

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Guide for agroecology in viticulture, a tool for the sector

HERBIN Carine, LEMPEREUR Valérie

Supporting viticulture towards agroecology

In 2014, the French public authorities launched the agroecological project for France. This project aimed at starting the transition of French agriculture towards new production systems that are more efficient in the economic, social and environmental dimensions.
In 2016, the National Institute of Origin and Quality (INAO), in charge of French geographical indications (GI), validated the integration of agrienvironmental measures into specifications of French GIs. French wine production, produced mainly by geographical indication, is therefore very much concerned by this orientation.
A work involving the French Institute of Vine and Wine (IFV) and INAO resulted in the publication of a guide of agroecology in viticulture in early 2017. This guide describes agroecological measures that can be integrated into the production rules of French geographical indications. Those measures are classified according to the five themes initially identified by INAO:
1 - Preservation and development of biodiversity,
2 - Control and reduction of fertilization,
3 - Reduce the use of pesticides and development of biocontrol,
4 - Seek better water management,
5 - Use of plant material more adapted to the challenges of agroecology.

An agrienvironmental measure is the implementation of a strategic orientation articulated on the five themes of agroecology. Each measure is constructed on the basis of the knowledge of sustainable viticulture, the evolution of practices, examples already existing in the regions, including the specifications of the geographical indications and the economic and interest groups. Knowledge and regulations have been updated by the groups of IFV experts.
The proposed measures contained in the guide include in particular a first series of eight standard measures prioritized by the INAO professional bodies and which could be integrated into the rules for the production of French geographical indications:
1 - Measures for cover crops around vineyard blocks
2 - Measures prohibiting chemical weeding on the entire surface of the vineyard plots
3 - Measures relating to the cover crops of the vineyard plots
4 - Measures to improve the efficiency of spraying equipment
5 - Measures to reduce the quantities of pesticides
6 - Measures to limit the input of synthetic mineral nitrogen
7 - Measures to preserve low walls, groves, terraces, ...
8 - Measures to respect the original morphological sequence of soils

This guide of agroecology in viticulture is a reference document accessible to all, which will be updated regularly. It includes many examples of measures that are generally simple to implement, already implemented in different regions, and described by IFV technical teams.
The guide has been complemented by two on-line tools.
The aim is to refine the agro-ecological strategy in a local context and a dynamics of territory:

- The pedagogical tool

For reading landscapes and the impacts of agro-ecological orientations and agri-environmental measures on a typical landscape.

- The compass tool

This tool is made to situate or determine the agro-ecological approach that has already been initiated or to be envisaged - by the winegrower, the winegrowers' group or the ODG - according to 3 main orientations with the choice of the corresponding agri-environmental measures:

1. Verification of regulatory compliance
2. Guidance on agri-environmental measures-types INAO
   (Transposable in the specifications of the ODGs in simplified procedure)
3. General orientation on the 5 agro-ecological themes

The "Guide for agroecology in viticulture" and its tools are at the disposal of geographical indications to confirm their agroecological approach and enhance the triptych "natural environment - know-how - characteristics of the product" which contributed to their recognition by the Public Authorities. But all of these provisions will obviously serve as a basis for reflection to other actors in viticulture than those of French geographical indications.

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Greater diversity and higher incomes found on study of agroecological farms in Western Guatemala

HOGAN Rose

Agroecology can make a positive contribution to smallholder resilience by improving diversity and incomes.

A comparison was carried out in the western highlands of Guatemala between 10 agroecology-based small-scale farms and 10 semi-conventional units in order to explore differences under 15 measures of resilience. A set of food-related indicators, biophysical characteristics and community parameters provided a preliminary and non-generalizable estimation of resilience levels among surveyed households. Statistical analyses were used to elucidate significant differences between the two groups. Local-market integration, gross agricultural income and plant diversity turned out to be clearly higher in agroecological farms. Gender roles follow traditional patterns within these households, although agroecology-adopting farming families show evidence of being on the move towards a more gender-balanced scenario. Solidarity-based economies have prompted both strong community organizations and a nascent level of autonomy, particularly among agroecology-based farmers. Agroecology is preferred among sensitized rural subjects whose deeply rooted land ethic catalyses wider social struggles, for example, open-pit mining resistance.
Agroecology-based farmers are more resilient than their semi-conventional peers because of a more diversified production system, a higher agricultural income, and a stronger social network. Challenges to agroecological adoption –and indeed to rural survival– include extremely limited public infrastructure, dearth of supporting policies and strategies and external threats posed by utility-inspired economic agents.

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Agriculture practices supporting biodiversity conservation in Israel: A meta-analysis

ISRAELY Liron, AMDUR Liron, TAMAR Dayan

Agricultural practices with spatial impact, that integrate natural habitats with agricultural land, have the highest scientific evidence for biodiversity conservation.

Farmlands can play a key role in supporting biodiversity conservation. Agricultural environmental schemes are encouraging land sharing strategies which require comprehensive evident base to be effective.
The aim of this study is to identify wildlife-friendly farming practices, which may be incorporated into Israeli farms, given the local climate, biodiversity, and the prevalent agricultural branches. We focused on identifying scientific evidence for the contribution of various agricultural practices in Mediterranean climates. An additional aim is to identify knowledge gaps and directions for future research.
We conducted a meta-analysis of 119 agri-ecological field studies, that were conducted in Mediterranean climate areas, and included quantitative evaluation of the influence of agricultural practices on the conservation of various taxonomic groups. 17 biodiversity-supporting agricultural practices were identified. Fact sheets were constructed: to identify agricultural practice requirements, the taxonomic groups and the conservation goals affected by each practice, possible effects on agricultural production (positive and negative) and the degree of scientific evidence for the contribution biodiversity conservation.
The agricultural practices that were found with the highest evidence for biodiversity conservation are: hedgerows, cover crops in plantations, preservation of natural patches in agricultural land and preservation of agricultural landscape mosaic.
Furthermore, knowledge gaps were identified, such as: 34% of the studies dealt with birds conservation in farmland, yet only 3% dealt with reptiles and amphibians - highly endangered groups. Only 2% of the studies dealt with vegetables farming, an important agriculture sector in the Mediterranean areas.
This study provides a tool to support decision-making processes in identifying practices that should be promoted by biodiversity and agro-ecology policy in Mediterranean climate areas.

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Participatory Assessment of Climate and Disaster Risks (PACDR)

JAWTUSCH Julia, BISILLIAT Maryline, DEGELO Simon

Climate change adaptation goes hand in hand with agro-ecology

Bred for all has developed a tool for "Participatory Assessment of Climate and Disaster Risks" (PACDR) that allows communities of smallholder farmers to identify risks related to climate change and to integrate adaptation measures into existing development projects. The tool has been developed and continuously improved since 2008 and has been applied in 25 rural community projects in countries of the Global South suffering from climate change. More than 670 rural community members, most of them smallholder farmers, participated in one of these workshops. In addition, around 600 members of local NGOs in southern countries received training to apply the tool in their projects.

We find that in most cases, adaptation needs identified by community members in the PACDR workshop are in line with agro-ecological principles and practices. Furthermore, the analyses revealed that often in developing countries, climate change related problem are overlaid with problems resulting from overexploitation of local resources. In many cases, solutions center on collective actions such as participatory governance of the commons.

The participatory approach of the PACDR tool seems promising to ensure ownership of climate adaptation actions and to launch discussion within communities. As a test on a Swiss farm showed, the tool could be just as well applied on farms and in rural communities in the global North.

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Test and implementation of best practices supporting crop pollination and biocontrol of pest in a systemic and co-innovation approach involving scientists, farmers and extension

JEANNERET Philippe

Practices supporting crop pollination and natural control of pests such as cover crops, intercropping, flower strips, conservation tillage will be implemented and investigated in a crop rotation of a farm network.

Conservation agriculture and agro-ecological principles have shown promising results regarding practices that promote crop pollination and natural control of pests. However, detailed investigation is needed on performance and trade-offs of combined practices along whole crop rotations.
A project will be launched in Switzerland which aims at defining and implementing practices to support and promote natural crop pollination and biological control of pests. The project will start in a co-innovation process involving scientists, farmers and extension services. A first inventory of agricultural practices that potentially support crop pollination and natural control of pests such as cover crops, under- and inter-crops, crops mixtures, conservation tillage, flower strips, etc. will be pragmatically scrutinized regarding feasibility, potential delivery of ecosystem services, etc. The objective is to combine a diversity of potentially supporting practices to boost pest control through natural enemies and reduce as much as possible pesticide application, and favour pollination of crops that require insects to succeed. Detailed management options will be established that take into account potential effectiveness and technical challenges. Second, practices will be implemented in typical crop rotations in a network of farms. During implementation, a series of performances and disservices will be measured such as pest control effectiveness, pollination (seed formation), service providers, pests, yield, soil fertility, pesticide application, acceptance by farmers, etc.
Results will be disseminated to stakeholders and policy makers to promote the agro-ecological transition.

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Multifunctional Plants (PlaM): biodiversity estrategies against Climate Change

JIMÉNEZ GÓMEZ Alberto, VELA CAMPOY María

Most of the world's diet (up to 95%) is made up of about 30 different plant species. Nevertheless, several studies say that the list of edible plants on the planet can range between 27,000 and 60,000 species. 90% of the caloric requirements of the world food are obtained, according to the FAO, from 15 crops and 8 types of domestic animals. In addition, it is estimated that 90% of crops may have been lost in the last 100 years and that 690 livestock breeds may have been extinguished. This kind of agriculture resulted not only in the loss of biodiversity, but also in the loss of soil, quality and availability of water and ecosystems services. It is the time to transit towards agroecological models in which short productions channels and plant diversity is central.

When we talk about multifunctional plants (PlaM) we refer to plant resources, adapted to the local climatic conditions which have multiple purpouses. They may be edible, medicinal, useful as companion plants in horticulture, recovery of degraded spaces. The promotion and characterization of species with this potential will be very useful for biodiversity improvement and conservation as an unique resource for our societies, contributing to the reactivation of local economy.

This proposal aims to create sustainable linkages between farmers and restaurateurs in order to raise awareness of a more consistent food production with the use of natural resources, leading to a deep reflection on the food production system and our ability to influence markets to promote food sovereignity, security and anticipate responses to Climate Change effects.

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MSc Student organised Agroecology Conference

KALAITZOGLOU Konstantinos

Student organised initiative to increase visibility of agroecology in society, and an opportunity to learn how to organise and host a conference.

Agroecology Day is an annual conference held in the spring time at SLU Alnarp. The conference brings together actors from various sectors of the global food system: academics, students, non-governmental organizations, social movements, and many more. Traditionally, Agroecology Day is organized by first-year SLU agroecology master's students, and as a result of these students' dedication and hard work, the conference is gaining in recognition and prestige.

Outcomes of the Agroecology day:
1. Main outcome – a conference including students, farmers, researchers, NGO workers.
2. Students, farmers and a variety of different attendees, learning about agroecology and interact with each other.
3. Student organisers gaining practical experience in facilitating a conference, including developing a theme, securing funding, finding relevant speakers and arranging their transportation and accommodation, marketing and catering.

Previous Agroecology Day themes:
- Agroecology Day 2014, Food Connections Growing
- Agroecology Day 2015, Building Food Systems from the Future
- Agroecology Day 2016, Agroecology Across Generations

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RUSDELA- Rural Sustainable Development Toolkit for Local Actors

KASSAI Melinda, GKISAKIS Vasileios, RÉTHY Katalin

The RUSDELA project is aimed at developing and testing an educational toolkit for local decision makers and key figures of rural communities across Europe in the context of an ERASMUS+ KA2. Hungary as a main applicant with partners from Greece, Bulgaria, Italy, Portugal and Spain from the sectors of academia, NGO, developmental agency and municipality association bring together a multidisciplinary/ cross- sectorial approach to strengthen sustainable development in disadvantaged rural communities.

The RUSDELA project is initiated by Butterfly Development (BD - Hungary). BD designed the ProRatatouille project, which implements community based organic agriculture education and production in disadvantaged regions. During this work we realized that non-formal adult education is also a necessary and useful tool among local decision makers when concerning village planning, sustainable development, and introducing agro-ecological practices.

Local decision makers have a highly influential role in defining and carrying out the goals of development in small rural communities, it is essential that these actors can gain motivation for sustainable development and means to access information.

The results of the RUSDELA project will be twofold. A toolkit will be developed, a sustainability training / manual for decision makers of small (smaller) rural communities in disadvantaged regions in Europe and it will be freely accessible after the project for all those who are interested in sustainable local development, for decision makers, experts and members of the civil society as well. Trainers will be also trained, who – after finishing the project – will be able to use the curricula in their own setting.

The toolkit helps adopt new adult education methods at international and at national level alike. The project establishes a wide international network of organizations and it can serve as a platform of cooperation for successful future partnerships based on the experiences and knowledge accumulated during the development of RUSDELA.

Involvement of agroecology:
The educational toolkit will have a chapter on agroecology. As the target group consists of decision makers and local key figures; agroecology is discussed in the context of food sovereignty, food production; social and environmental connections on a local (village), regional and food system level. Training participants will become familiar with basic methods of mapping and redesigning the local food system from and agroecological perspective and learn about agroecological practices in rural development across Europe.

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Reduced tillage in organic farming? – Can under-sown legumes and row hoeing be the way forward?

LAGERQUIST Elsa

Multi-functionality, an approach for sustainable cropping systems.

Population growth and increased human consumption, as well as climate change challenges present agricultural practices. More food need to be produced while soil fertility is maintained and climate change mitigated. Out of regional and global needs practices related to conservation agriculture have developed to increase the sustainability of cropping systems e.g. to increase soil fertility and reduce soil erosion. Such practices include minimal soil disturbance, permanent soil cover and sound crop rotations. However, minimal soil disturbance can facilitate the propagation of weeds. Therefore, weeds often become a severe problem in conservation agriculture and the function of the system dependent on herbicides. With a multi-functional approach to cropping system design we are working on a system of organic farming that is less dependent on soil tillage and animal manure. Thus to achieve beneficial effects on soil fertility, while cereal yields are maintained or even increased.

Our objective is to optimize the crop sequence spring cereal – winter cereal regarding yield, nitrogen use and weed control. We sow the cereal crops in bands with a wider row spacing than the conventional 12 cm, to allow for row-hoeing. At the same time we use under-sown leguminous crops to provide weed control, soil cover and nitrogen fixation. We investigate the capability of different under-sown legume species, combined with different temporal and spatial placement, to grow and function in the system, as well as their impact on nitrogen use of the winter cereal. The spatial arrangements have implications for the time of sowing and the intensity of row-hoeing. Previous studies has evaluated the effect of the different system components, i.e. row hoeing and under-sown crops on weeds. With the technique of row traction the components are now put together into one system. The system will be evaluated in terms of yield, weed control, nitrogen cycling and carbon sequestration.

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Digital revolution in the agricultural sector: Fitting in the Agroecological approach?

LAZZARO Mariateresa

Soil health is a prerequisite for sustainable farming; the platform SOILHEALTH.CAPSELLA.EU provides farmers with an application for soil conditions self-assessment.

SOILHEALTH.CAPSELLA.EU platform supports farmers across Europe in maintaining healthy agricultural soils. The spade-test application on the platform allows self-assessment of soil health using a widely used, qualitative method for performing the observation of soil conditions. It gives the farmer information on soil fertility and on mechanical operations effects on its structure. Farmers, by using the application for recording their observations, are able to share their findings, learn from each other and seek further ad-vice to the community.
The spade test application, available for PC, tablet and smartphone, guides the user through an easy touch-enabled interface to define the soil features for different layers in a sample. At the end, summary results highlighting the positive and negative features are given and shared, eventually adding comments and a short description of farm practices.
SOILHEALTH.CAPSELLA.EU is the outcome platform from the collaboration of Scuola Superiore Sant'Anna (Pisa) with farmers from Greece (Aegilops, The Greek Network for Biodiversity and Ecology in Agriculture) and Italy (Esapoda, Scuola Esperenziale Itinerante di Agricoltura Biologica) in the framework of the H2020 project CAPSELLA (www.capsella.eu). This experience is framed in the common effort from farmers and researchers in the project to develop new models of participatory innovation in biodiversity-based agriculture by working with open software, open data and open hardware.
In this experience, farmers showed interest in ICT solutions supporting their activities as well as the need to integrate local knowledge with external information (e.g. coming from open data). In SOILHEALTH.CAPSELLA.EU, information coming from open data, is complementary to the knowledge and practices of the farmers, and does not substitute farmers' decision making process. It rather improves farmers' decisions and empowers the local knowledge with additional information coming from external sources.

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Sustainable Intensification: Agroecological appropriation or contestation?

LEVIDOW Les

Sustainable intensification (SI) may seem yet another example of 'greening' the dominant agro-food system, yet SI agendas may offer opportunities for CSO-farmer alliances to promte agroecosystem approaches.

Agroecological practices are niche innovations which can play various roles in the wider agro-food regime. For at least a couple decades, agroecological practices have been promoted by farmer-CSO alliances contesting the incumbent agro-food regime. More recently some agroecological methods have been selectively appropriated by that regime, especially through the concept sustainable intensification (SI). How does this relate to wider agendas for agricultural futures, especially in Europe? The answer here draws on two theoretical concepts: a neo-productivist paradigm (Marsden, 2012) and a nascent corporate-environmental food regime (Friedmann, 2005).

Sustainable intensification (SI) entails tensions around various aims and trajectories of agricultural systems. European expert reports analyse trade-offs between productivity versus sustainability aims, as a basis to seek innovative methods which can minimise such trade-offs or even offer synergies (Buckwell et al., 2014; Lampkin et al., 2015). Although productivity can broadly include environmental services as well as products, in practice it is more narrowly seen as the yield of specific commodity crops, in turn attributed to specific techniques such as bio-input-substitutes. This priority conflicts with efforts to promote biodiversity and wider synergies for minimising trade-offs. The latter concept implies shared goals, yet these diverge among stakeholder groups taking up SI.

SI agendas include only two components of agroecology – scientific knowledge and agronomic practices . As the third component, social movements are essential for agroecological experiments to build farmers' collective knowledge and gain policy support for a transformative role (Wezel, 2009). Linking all three components, European CSO-farmer networks have sought to influence policy in several arenas. Their strategic interventions have generated or highlighted conflicts around different forms of intensification.

A high-profile target has been the 'greening' agenda of the post-2013 CAP. After several years' efforts by CSO-farmer networks, the European Commission adopted more stringent environmental criteria for CAP pillar 1 subsidy, effectively favouring biodiversity for agroecosystems. After counter-lobbying from the agri-industry lobby, however, the ultimate criteria favoured a selective appropriation of agroecological techniques for higher yield; productive options such as bio-inputs substitute for (or even supplement) agrochemicals, yet still gain subsidy.

Although agroecology and SI remain implicit within EU policy documents, policy arenas facilitate agroecological niche innovations, with different empowerment strategies. Under the CAP pillar 1, agroecological 'productive options' conform to the incumbent food regime, though agroecosystem approaches can also be remunerated. CSO-farmer networks have gained greater success for their agroecological agenda in EU research and innovation arenas, e.g. the EIP on Agricultural Productivity and Sustainability, where conflicting approaches can co-exist. Thus 'conform versus transform' strategies

are exercised in diverse arenas, each with different outcomes in sustainability criteria and policy support.

The SI agenda was initially welcomed for highlighting agroecological methods but soon became suspect for adapting them to agro-industrial systems and conventional supply chains. Like other 'greening' initiatives, SI could split the movement's progressive trend from the radical anti-corporate trend (Holt-Gimenez and Shattuck, 2011: 133-34); but instead they have come closer together through joint interventions in policy arenas.

From a transformative perspective on the incumbent agro-food regime, SI may seem yet another example of conventional agriculture 'greening' the dominant agro-food system. Nevertheless SI agendas may offer opportunities for CSO-farmer alliances to press for agroecosystem approaches based on farmers' knowledge. By recognising these tensions, food movements can better develop strategies for intervening in SI agendas for transformative agroecosystem approaches.

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Shallow erosion in the Alps - Agroecology as a possible problem solving strategy

LÖBMANN Michael

Agroecology is a possible strategy for preservation of remote cultural lands, biodiversity and related ecosystem services in the Alps.

Shallow erosion is a small-scale removal of vegetation cover on steep grass slopes, leading to a long-term loss of grassland area. While single shallow erosion events seem negligible, their frequent occurrence leads to substantial loss of alpine grassland and related ecosystem services. In the last decades, farmers and environmentalists have reported an increased occurrence of shallow erosion on pastures and meadows in the Alps.

Geological and biological factors affecting the occurrence of shallow erosion are diverse and often vary largely even within a few meters on a single slope. The multitude of factors involved, their combinatorial effects, and the long-term character of landscape changes have made it difficult to evaluate specific geological and biological indicators for shallow erosion. However, increased shallow erosion has been shown to be closely related to changes in grassland management. This is likely attributed to socio-economic changes, such as low prices for agricultural products, or reduced interest in remote grasslands.

The interdisciplinary character of the increase of shallow erosion includes social, economic, geological, climatic and biological factors, which demand a holistic approach in order to thoroughly address the problem. Agroecology, as representing a discipline aiming at holistic problem solving strategies, could be a useful tool for this. An agroecological approach involving stakeholders, processing plants, retailers, local communities and policy makers could be a viable way to raise awareness of the problem situation and to find appropriate solutions in the long term for reduction of shallow erosion in the Alps.

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An exploratory assessment tool to evaluate the environmental, health, social and territorial impact of our plate

LOPEZ MERINO Pedro, LAMINE Claire

We intend to create a discussion on the multidimensional aspects of an agroecological transition, aiming to see how our food choices have an impact on them.

An ecological transition, in its larger sense, is composed of at least three aspects or scales : the environmental, the social and the individual. These aspects are themselves composed of several sub-aspects (such as reduction of emissions in the case of the environment, inequalities in that of society, and health and wellbeing for the individual). None of these categories are fixed, they are derived out of an inquiry into the type of long-term outcomes we expect from our socio-economic organisation, and therefore are subject to being determined in a participative manner.

We intend to create a participatory assessment tool of interactions between food choices (our "plate") and environmental, social and individual issues, which can be useful in the reflection of households, organisations, schools, etc. This work will be done over the course of two years starting in 2018, with different levels of complexity in order for it to be of interest to researchers, the public at large, NGOs and anyone interested in a transition towards sustainable food systems.

During our presentation we will introduce the main aspects of this tool and create a discussion as to how it should be conceived (namely which categories to be included, whether the three main aspects are indicative of everyone's understanding of transitions, how to weight each aspect or category, etc.) We will use an interactive method consisting of creating "teams" representing each aspect and helping to create a dialogue into the different issues at stake.

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Influence of cover crop management techniques on soil ecosystem services

MAGAGNOLI Serena, MASETTI Antonio, DEPALO Laura, CAMPANELLI Gabriele, CANALI Stefano, LÖVEI Gabor, BURGIO Giovanni

Cover crop termination techniques enhanced biological control by soil-dwelling arthropods.

Cover crops, by increasing vegetation complexity in agro-ecosystems, may lead to a positive impact on natural enemies contributing to reduce pest outbreaks.
In this study, two-year experiment was carried out in an organic vegetable system with the purpose to assess predation pressure under different soil management techniques. Field experiments were performed at C.R.E.A Horticulture Research Unit of Monsampolo del Tronto in Central Italy within two fields characterised by different cover crop (vetch & barley) and cash crop (tomato & zucchini respectively). Green manure and roller crimper were the selected cover crop termination techniques and they were compared with a biodegradable plastic mulched control (MaterBi) that is the method commonly used to control weeds in many vegetable organic systems.
Predation pressure was evaluated by using artificial caterpillars built with green plasticine. Marks left on their surface were assigned to higher taxonomy ranks distinguishing among chewing insects, birds and mammals. Frequencies of artificial caterpillars predated by chewing insects were correlated with the activity density of Carabidae with body length major of 15 mm. Our results highlighted very different responses between the two investigated fields. In vetch-tomato system, the rate of predation was higher in roller crimper; a positive correlation was also found between frequencies of attacked artificial caterpillars and the activity density of carabids (>15 mm). In contrast, in barley-zucchini system neither differences among treatments nor significant correlation was found. These discrepancies were strongly affected by the different crop system. Our study highlighted strong interactions between ASC used in the rotation with the termination techniques and the cash crops cultivated. In conclusion, artificial caterpillar method seems to be a practical and suitable method to measure ground-level predation.

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Influence of cover crop terminations on pest dynamics in an organic vegetable system

MAGAGNOLI Serena, MASETTI Antonio, DEPALO Laura, CAMPANELLI Gabriele, CANALI Stefano, BURGIO Giovanni

Cover crop management may influence the soil-crop system, leading to a different suitability of the plant to aphid infestation.

Habitat manipulation by means of cover crop management lead to many benefits for soil-crop system such as weeds control and enhancement of natural enemies.
In this study, we compared two different cover crop termination techniques (roller crimper and green manure) with a synthetic biodegradable film control (MaterBi), which represents the approach commonly used in many organic vegetable systems.
Field experiment was carried out on zucchini plants during two consecutive years at C.R.E.A Horticulture Research Unit of Monsampolo del Tronto in Central Italy.
Natural enemies and pests were monitored fortnightly from June till the beginning of August by visual samplings. Aphid infestations caused by Aphis gossypii were higher in MaterBi than in roller crimper and green manure treatments. Our hypothesis is that soil temperature of MaterBi treatment was responsible of the major vegetative plant growth of zucchini plants, leading to an higher susceptibility of aphid infestations.
However, in all treatments natural enemies controlled aphid infestations highlighting the important role of habitat manipulation strategies to improve biological control.
MaterBi treatment increased aphid infestation and for this reason roller crimper and green manure may be suggested as an efficient approach to mitigate aphid infestation, in comparison with the conventional cultivation method.

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Intercropping winter wheat and white clover to enhance beneficial ground beetles

MANSION-VAQUIÉ Agathe, LASCOSTE Mylène, FERRER Aurélie, WEZEL Alexander

In conservation biological control, many initiatives aim at increasing interspecific plant diversity within fields or in their vicinity, in order to favor the establishment and survival of beneficial arthropods. The association of cereals and legumes is considered as a promising agroecological practice for low-input or biological agriculture because it provides ecosystem services such as weed control and N fertilization. Moreover, such an increase in field plant diversity changes the structure of the crop canopy and may therefore impact beneficial ground beetles presence and activity.

This study investigates the effect of a white clover - winter wheat association on the ground beetle community in 0.72ha field experiments settled within seven organic winter wheat (Triticum aestivum) fields in South-East of France (Auvergne-Rhône-Alpes region).

From April to June 2016 and from March to June 2017 the crop canopy characteristics at the ground level (percentage of soil cover, microclimate and luminosity) were monitored every two weeks and ground beetles were collected using 48h pitfalls traps every three weeks in 2016 and every four weeks in 2017. Potential of predation was estimated by using sentinel preys made of plasticine, which record bite attempts by ground beetles.

Results from 2016 show that intercropping clover and wheat increases the proportion of covered soil by 15% in average and increase the humidity compared to sole wheat. Similarly, luminosity reaching the ground is lower in the presence of clover. We also observe that activity-density of ground beetles is positively impacted by the presence of white clover cover all over the sampling period and species richness tends to be higher in the association than in sole wheat. Predatory and polyphagous species dominate sampled ground beetle communities. Predation rate by ground dwelling chewing insects is higher in the sole wheat compared to wheat associated to clover.

These results suggest that wheat-clover association might provide a more attractive habitat to beneficial ground beetles compared to sole wheat crop. However, the presence of such natural enemies might not result in higher pest control.

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A participatory approach between researchers, farmers and beekeepers to define a common point of view about semi-natural habitat and agro-ecosystem service.

MARINI Simone

The collaboration between researchers, farmers and beekeeper is a crucial link to provide a wider understanding of semi-natural habitats to stakeholders, and the link between these categories is of extreme importance to improve ecosystem service provisioning in agro-ecosystems.

During the European QuESSA project - Quantification of Ecological Services for Sustainable Agriculture, www.quessa.eu –, which ended in February 2017, an interesting knowledge exchange process between farmers, beekeepers and researchers was initiated.
The main goal of the projects was to quantify the ecosystem services, mainly pollination and pest control, provided by semi-natural habitats (SNHs) to some of the key crops in Europe. The project involved 8 countries, including Italy. In Italy the project investigated if pollination in sunflower was affected by SNH composition and configuration. The study was carried out in the Pisa plain, an alluvial plain characterized by medium-high intensive agriculture. During the project, as documented in previous studies, honey bees were the most common pollinator of sunflower with more than 95% of visits. Moreover, as expected, pollen from sunflower was almost ignored by honey bees. From this result it turned out that the link between farmers and beekeepers of the area was not just the pollination service honey bees give to the crop, but it was also the role of SNHs in supporting the honey bees' request for protein-rich pollen .
After that we decided to perform interviews to beekeepers to better understand the location of hives in the area and most important the relationship between farmers and beekeeper. Beekeepers are concerned about the use of pesticides because of their impact on bee health, and they are afraid that modern sunflower varieties have a poor nectar content resulting in a lower honey production. Thus, in order to link the two sectors, two days of active participatory approach were took in action.
Firstly a field day was organized by researchers, to talk about pollination by both natural and managed pollinators, at the presence of farmers and beekeepers of the area. Initially, everyone was involved in an open forum, directly in the field using pictures of pollinators as didactic support. This was followed by a transect walk in a clover-hairy vetch cover crop field, aiming to assess insect visitation rate. On one hand this activity showed to farmers and beekeepers how researchers assess insect visitation rates, and at the same time farmers became aware of the service they may provide to bees and wild pollinators by simply using legume cover crops that are also very positive for soil fertility conservation.
A second activity was organised during the final conference of the QuESSA project in Pisa. Researchers, farmers, beekeepers and other stakeholders were involved in a simplified version of the "territory game". Stakeholders were asked to discuss about the actual agro-ecological problems of the area and the possible solution, using maps of the region to design areas where positive and negative interactions between agriculture and SNHs were identified.
The results of these activities were that farmers became aware of the fact that bees perform a service to their crop production, beekeepers became aware of production constraints farmers have to coop with, and researchers became aware of the gap in communication between various local stakeholder groups. All participants agreed to take more care about the request of the counterparts in the sense of a greener and

pollinator friendly agro-ecosystem, where all the actors could benefit, possibly involving other stakeholders. For example seed companies were mentioned in order to produce bee friendly sunflower varieties. The attention of participants went especially to SNHs, which were believed to be important in providing benefit for the society, and were evidenced as the main link between farmers and beekeepers.

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The ecology of perennial grains: First results from The SITES agroecological field experiment (SAFE) with intermediate wheatgrass (Kernza) in sole and intercrop

MÅRTENSSON Linda-Maria, JENSEN Erik Steen

A shift away from systems based on annuals to perennial grain systems with permanent plant cover, avoiding the negative consequences of inverting soil tillage on soil organic matter, will have potential in a future based on principles of sustainable and ecological intensification (Bommarco et al 2013; Crews and Dehaan 2015). The Land Institute has domesticated intermediate wheatgrass (*Thinopyrum intermedium*), named "Kernza" (DeHaan et al 2005), which has been reported to yields 33% of wheat grain yields (Culman et al 2013). The vigorous root system produced by Kernza delivers ecosystem services associated with a production system based on sustainable and ecological intensification, such as reduced erosion and nitrate leaching compared to annual cereals (Culman et al 2013; Crews and Dehaan 2015).

The SITES Agroecological Field Experiment (SAFE, an open agroecological research infrastructure), at SLU Lönnstorp Research Station in Southern Sweden, includes a perennial agroecosystem with intermediate wheat grass grown with and without the legume *Medicago sativa* (lucerne) as intercrop in an organic farming system. Preliminary data will be presented on yield and N acquistion in Kernza and measurement on AMF abundance in Kernza plots as compared to winter wheat plots. At the SITES Lönnstorp research station a thinning experiment has been established in a three year old stand of Kernza to evaluate the effects on yield and N acqusition. Data will be presented at the workshop.

Acknowledgements
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The future of agro-forestery local breeds pig farming in Region Auvergne Rhône-Alpes

MARZIO Antoine

Presentation of the project sustained by the "Association pour la promotion de la diversité porcine en region Rhône-Alpes" ("DIVAPORC")

The region of Auvergne Rhône-Alpes, of well-known deli-meat tradition, has no longer local pig breeds, which completely disappeared half a century ago.

The interest of local pig breeds is their adaptation to extensive forms of livestock farming, in agroforestry, and their ability to respond to new customer demands (organic, animal welfare, organoleptic qualities, etc.)

In addition, such farms, combined with the set up of local food processing chains, would have the advantage of developing profitable activities, bringing added value and therefore jobs, in rural areas devastated by a lost of momentum in agriculture and demography.

The association for the promotion of porcine diversity in the Rhône-Alpes region (DIVAPORC) has set itself the objective of restoring a porcine identity to the Region by launching a project to create a piglet and breeders selection and production station of local pig breeds which will be made available to regional farmers.

It will then be necessary to reconstruct lost ancient races, such as the Dauphiné or Bresse breed.

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Ecological permeability of agricultural landscapes

MASSALOUX Damien, DELCLAUX Julie

From research to action, how to set up an agriculture that shapes the landscape for biodiversity?

Under the implementation of the regional green and blue ecological belts policies, our research project aims to improve knowledge about agricultural landscapes, regularly criticized for their alleged impact on wildlife. Hence, we focus on the ecological permeability of these areas, which we define as its capacity to provide shelter and food resources for local animal and plant species.

We present here the main goals of the project: understand better how public policies and socio-economic context can impact on the farmers' decisions, how agriculture shapes landscapes, and finally how landscape organization impacts biodiversity.
Thus, the interest of our project is in our interdisciplinary approach, connecting natural and social sciences to understand better the interconnections of agricultural landscapes and biodiversity.

Our project is directly linked to the regional public policies. We therefore aim to cover the whole spectrum from research to action, using the improvement of knowledge about farmers' decision making process and impacts of agricultural landscapes on wildlife to supporting the adaptation or improvement of farming practices and landscape organization in favour of biodiversity.

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Transformative Agroecology Learning in Europe: Building Consciousness, Skills and Collective Capacity for Food Sovereignty

MAUGHAN Chris

Rather than focusing on agroecology education as a process of individual learning, social movement organizations are taking a collective approach to develop transformative agroecology learning to advance food sovereignty in Europe.

This poster explores the meaning, practices and potentials of 'transformative agroecology learning' as a collective strategy for food system transformation. Agroecology has been proposed as a key building block in the struggle for food sovereignty. Our poster is based on our qualitative and action research with the European Coordination of Via Campesina to develop the European Agroecology Knowledge Exchange Network (EAKEN). This work is linked to the global network of La Via Campesina and builds on the strong experiences and traditions of popular education in Latin American peasant movements. Rather than focusing on agroecology education as a process of individual learning, we show how a transformative agroecology education can be strengthened as a critical repertoire of action used by social movements to advance food sovereignty.
Our analysis contributes a new theory of transformative agroecology learning based on four key 'pillars' or qualities: horizontalism; diálogo de saberes; combining practical and political knowledge; building social movement networks. The poster features a schematic illustrating the way these four pillars link agroecological practice to the political project of food sovereignty. While these different elements of transformative agroecology learning were present across the EAKEN, they were unevenly developed and, in many cases, not systematized. The framework provides a tool to strategically and reflexively systematize and strengthen a transformative agroecology learning approach as a key building block of the food sovereignty project.

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Permaculture in urban garden in Lyon

MAURINES Béatrice, RENIER Louis

The results presented in this workshop are an outcome of a collective inquiry conducted by the students of the Master "Sociology and anthropology applied to local development (SADL) proposed by the University Lumière Lyon 2 under the supervision of Béatrice Maurines, socio-anthropologist. This research was a command of the association "Le passe-jardins" and aimed at understanding the food producing dimension of gardens as instrumental in the development of food autonomy in urban areas. It underlined the promising dimension of permaculture for such a challenge shared in common by the city and the metropolitan area of Lyon. The inquiry covered 20 gardens for the study of which 68 interviews were realized, between fall 2016 and spring 2017.
The questions raised by permaculture are twofold: representations and experimentations.
How the gardeners position themselves vis à vis permaculture? Are they assimilating permaculture with an increase of crop production of gardens? How permaculture is concretely applied? What happens in the gardens where it is put into practice? The answers are in general the following: The gardeners don't spontaneously equate permaculture with production. The perceive in permaculture for dimensions: technical, ecological, human, and economical in terms of workforce.
What concerns the experimentations, we can note that they are numerous, differently put in practice, and are customized to the reality of each garden.

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Providing accessible information and adaptation strategies for tackling impacts of climate change on cropping systems: the ADAPT2CLIMA tool

MERANTE Paolo, MORIONDO Marco, GIANNAKOPOULOS Christos, PAPADOPOULOU Maria, DIBARI Camilla, BRILLI Lorenzo, KARALI Anna, LEMESIOS Giannis, CHARCHOUSI Despoina, PAPADASKALOPOULOU Christina, TENENTES Vassilis, VAROTSOS Konstantinos V., TROMBI Giacomo, LEOLINI Luisa, COSTAFREDA Sergi

Elaborating and providing an accessible information is crucial for defining effective strategies for the adaptation to climate change of agriculture

The obvious and indisputable change of climate and its variability is already having relevant consequences on human life and related activities and this trend is expected to be worse in future periods. In particular, amongst all production sectors, agriculture is the one that has to bear the most significant pressures and consequences due to such changes. In this respect, it is of key importance to acquire knowledge about the potential climate changes and their impacts on cropping systems in terms of phenological changes and yield fluctuations. To meet this priority need, the project LIFE ADAPT2CLIMA aims at reducing vulnerability and increasing resilience to climate change risks by assessing the effectiveness of the available adaptation measures, increasing capacity building and developing strategies for the adaptation to climate change of the agricultural sector on three Mediterranean islands: Sicily (Italy), Crete (Greece) and Cyprus. These three islands share similar threats and vulnerabilities in terms of water management, which depends exclusively on their own water resources, the expected effects of climate change on the coastal agriculture and the potential marine inundations, which, in turn, will reduce both soil fertility and the water availability for irrigation.
To pursue the aforementioned purposes, this project foresees the development and implementation of an interactive tool (ADAPT2CLIMA tool) for supporting stakeholders, from farmers to policy makers, to plan adaptation strategies. To this aim, the tool is understood as manifold in which all existing knowledge and those raised by the project's activities will be collected and properly organized to be effectively used by stakeholders. Accordingly, all collected information and data as well as elaborations will be conveyed through mapping coupled with detailed explanations. Based on this logical structure ADAPT2CLIMA tool will provide:
(i) Climate change projections, namely, the projected climate on the three islands for two different emission scenarios (RCP 4.5 and 8.5) and based on one of three state-of-the-art Regional Climate Models that can be selected (i.e. SMHI-MPI, SMHI-MOHC, SMHI-CNRM).
(ii) The assessment of the future hydrological conditions related to agriculture. For selected pilot areas in each Mediterranean island of interest, a set of maps will be provided presenting future groundwater level, based on selected climate change scenarios. Predicted groundwater quality assessment will also be presented for specific pilot areas mainly suffering from salinization.
(iii) The assessment of the vulnerability of selected crops (namely, barley, wheat, potato, tomato, olive tree and grapevine) to climate change. For each climate scenario, both the degree of vulnerability of each crop to climate change and the effects of potential changes (by varying vulnerability indicators) in the degree of such vulnerability can be explored.
(iv) A set of adaptation options, which may have potential effects in reducing vulnerability of a crop to climate change.

(v) Socio-economic indices, which may be useful for planning targeted policy especially at local level (e.g. rural areas, municipalities).
Furthermore, users, following authorisation, may insert case specific information to allow the development of specific adaptation strategies. The ADAPT2CLIMA tool, which will be managed and updated by a technician, will be available at the project platform for five years.
Although the tool is currently under construction a beta version is already available and a detailed update on its development is presented.

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Convergences, divergence and specificities between Agroecology and Organic Agriculture in Italy

MIGLIORINI Paola, LAZZARO Mariateresa, BARBERI Paolo, CIACCIA Corrado, COLOMBO Luca, CANALI Stefano

Despite some real or supposed divergences, there is strong convergence between organic farming and agroecology and it is desirable that they work in synergy for the development of truly sustainable agri-food production systems contributing to the solution of societal challenges.

The paper seeks to assess the perception of Organic Farming and Agroecology by technicians, researchers, farmers, politicians, NGOs and consumers with respect to: i. the definition; ii. how they are placed in relation to other agricultural and food approaches/methods; iii. what are the specific agricultural and livestock practices.
We present here the preliminary results by analysing the responses of 35 interviewed (final target 1000) face-to-face and on-line through a structured questionnaire with 27 questions:
1. Actual perception of AE and OA (Q1-Q7)
2. Comprehension (Q8) and personal approach (Q9-Q15)
3. Future expectations (Q16-Q22)
4. General information of respondents (Q23-Q27)
This first results show that, despite some real or supposed divergences, there is strong convergence between organic farming and agroecology and it is desirable that they work in synergy for the development of truly sustainable food systems contributing to the solution of societal challenges.

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Participatory selection of cover crop cultivars aimed at improving their capacity to cover the soil and their suitability to be destroyed in early spring.

MOONEN Anna-Camilla, LEONI Federico, CARLESI Stefano, LAZZARO Mariateresa

In analogy with crop cultivar selection based on their productive capacity and for example resistance to diseases, there is a great need to perform similar cultivar selection to offer cover crops to farmers that are delivering the best agroecosystem services while being compatible with the management requirements in low-input agriculture.

In this contribution, we are promoting a relatively new approach aimed at improving the uptake by farmers of cover crops in agroecosystems. The approach consists in performing cultivar selection of legume species that are actually used as cover crops but that were not selected for this purpose, or that occur in the spontaneous vegetation in the study area. The selection aims at traits that would make these species more adapted to offer farmers cover crops that are providing the best agroecosystem services while being compatible with the management requirements in low-input agriculture, such as low competition with the crop, and high capacity to cover the soil and suppress weeds. Analogous to crop cultivar selection, different cover crop cultivars should be selected for various agro-pedo-climatic conditions and for different cropping systems. Another example may be the selection of cover crops that can be used at different times in the crop cycle; as pure cover crop, in the inter-crop period, or as living mulch entirely or partially overlapping the crop cycle.

In this project two systems will be tested:

1) Relay cropping of legumes species with durum wheat aimed at suppressing weeds in spring and cover the soil in summer after wheat harvest.
2) Perennial or annual self-seeding legumes as living mulch to suppress weeds and improve soil chemical, physical and biological fertility in no-till vegetable systems.

The legume species will be screened under different environmental conditions in on-station trials. Based on these trials, some farmers will select the most promising varieties and test them in on-farm trials. The catalogue fields established on-station in different regions in Italy will be populated with information about phenological traits, soil and climatic adaptability, evaluation of different agronomical uses of the subsidiary crop (as living mulch, dead mulch), including the capability to be used in cover crop mixtures, weed suppression capacity based on various weed response traits (annual/perennial; monocots/ dicots; ruderals/competitors/stress tolerant species).

The species to be used for cultivar selection will be identified through a participatory approach involving farmers, researchers and a seed selection company. This activity will be part of the H2020 Project IWMPRAISE (grant number 727321).

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Agroecology and Agroforestry: including woody vegetation in agricultural systems

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The agricultural intensification has led to the destruction of millions of hectares of agricultural systems that counted on the woody component to be sustainable. This conducted to the reduction of the efficiency on the use of the solar radiation by hectare in many parts of Europe and therefore the capacity to create soil with high organic matter content. Climate change is nowadays trying to be overcome with the mitigation options of increasing soil organic matter content through the use of deep rooted perennials or agroforestry (EU Decision 529/2104). This is usually accompanied by an increase of the biomass production per hectare, but, with time, a reduction of the crop/species that are wanted to be cropped in the land, as they are usually associated to varieties that were selected to increase production in open sites. The session will deal about the evaluation of those combinations of woody perennials and crops that allow better benefits for the crop. Four examples will be shown, the first will be the selection of varieties of wheat, barley or rye to be grown under trees with the better performances in different environments, the second one will be about the increase of the active compounds on medicinal plants when grown under trees, the third one the better quality of cacao when it is grown in combination with trees and the fourth one the useful use of woody vegetation in permanent grasslands. The session will be open to any example that shows beneficial examples of synergies between woody perennials and herbaceous crops/pastures.

Small ruminants in a sustainable socio-ecological metabolism: a case study from Samothraki, Greece

NOLL Dominik

I am presenting a socio-ecological case study about a small Greek island that aims at pursuing scientific and practical goals. The conceptual framework of social metabolism[1] serves as the scientific basis to answering key questions regarding more sustainable farming practices and how they can be integrated into farming communities, within protected areas on islands. The outlined transdisciplinary approach involves the application of a decision support app for small ruminant farmers (Happy Goats App)[2] in order to support social learning opportunities among these farmers. It also enables public involvement into the research process (citizen science).

The north Aegean island of Samothraki represents a unique site of archaic wilderness, rarely found among the Greek archipelago. As a result of the island's outstanding ecological values, the largest part of its terrestrial area and 50km^2 of the adjoining marine area, were included in the Natura 2000 network. The ongoing efforts of the scientific and local community to include the island into the worldwide network of Biosphere Reserves resulted in a successful submission of an application to UNESCO in 2013. Despite increasing efforts in environmental protection activities, the development process of recent decades has generated a wide variety of environmental and social problems the island community is currently facing. One of the major threats is the sharp increase in free roaming sheep and goats since the 1960s, which has led to overgrazing, forest reduction and soil erosion[3]. As studies from other Greek islands and mainland regions reveal, the agricultural and respectively, the small ruminant sector, is transforming throughout the country at unprecedented rates for several decades now[e.g. 4,5]. Throughout the Mediterranean, livestock has begun to lose its many essential functions which had been fulfilled with traditional systems. Those systems were built mostly on circular nutrient and resource flows with little or no external inputs, where animals were mainly fed on biomass not suitable for human consumption and manure was used as fertilizer for crop production[6]. Land use and marketing practices have gradually been adapted according to these changes. The former, mainly circular, local economies are now being increasingly replaced by import oriented economies, making it more difficult for farmers to sell their products at local markets. It is therefore of great importance to understand how current development pathways affect small ruminant farming on islands and to identify feasible strategies for a sustainable future of the sector on Samothraki.

Our findings indicate that since the 1980s grazing resources were not sufficient to keep the growing number of animals adequately fed and farmers had to supply more imported animal feed[7]. Data from local fodder importers show that, despite increasing animal numbers in the 1990s, imports of supplementary feed did not initially increase, resulting in growing grazing pressure on the islands ecosystems. After local feeding resources became less productive and numbers of animals suffering from malnutrition

increased, farmers were forced to supply more feed which then only exacerbated their difficult economic situation. Since 2001 the sector is declining, with the reduction of the number of animals to those levels experienced in the early 1990s and a 50% reduction of the population economically active in the primary sector.

A planned survey with several dozen local sheep and goat farmers will be conducted by using citizen science methods and the Happy Goats App. The survey will not only yield high quality bottom-up data which will be used for outlining scenarios that aim for a sustainable development of the sector in three dimensions, i.e. socially, economically and environmentally. It also serves as an opportunity to introduce the Happy Goats App to farmers and foster social learning opportunities which might open new and promising perspectives for local small ruminant farmers. In my contribution, I will give background information on the ongoing research process on the island of Samothraki, present latest findings about the small ruminant sector of the island and report from the survey with local small ruminant farmers.

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The potential of agroecology and silvopasture to enhance the resilience of grassland systems in the island of Ireland

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Agroecology principles could potentially be used to examine grassland areas and decide where to establish silvopasture systems to decrease the risk of pests and/or climate change and increase biodiversity and agriculture productivity.

Pastoral systems in Republic of Ireland (RoI) and Northern Ireland (NI) occupy large extents of land which are largely based on permanent grassland for ruminant livestock and driven by challenges such as high GHG emissions, sustainable intensification, resilience and pressure for forestry expansion. Agroecology principles such as Silvopasture (Altieri et al., 2015), could offer a strategy to enhance resilience for pastoral systems and help towards a carbon neutral agricultural sector (Fornara, et al., 2017). Silvopasture is an intensive agriculture production system (McAdam et al., 2007) where trees are grown in grassland that is grazed or harvested for silage. Its major attraction in RoI and NI is the production of a more uniform grass production profile, a longer growing season than an open sward and provision of ecosystems services. Policy strategies in RoI and NI have identified the comparative advantage in growing trees as a strength of the agriculture and forest industries. In Silvopasture systems, the different components have processes at different temporal and spatial scales and these confer to the system high resilience in relation to global change. These benefits have resulted in silvopasture now being promoted in the Iisland of Ireland, through strategies on Forest Research (DAFM, 2015) and Sustainable Agricultural Land Management (DAERA, 2017) where these recommend that approaches to silvopasture, on a range of agricultural land uses, be examined. However, associated climate change, pests and diseases pose multiple risks that may contribute to health and long term sustainability problems for these systems.

Climate change may bring vulnerability to pests and diseases and, in some cases, agricultural intensification may cause deterioration of soil and habitat quality with consequences on tree physiology, resulting in higher susceptibility to some pests and pathogens. A better understanding of pest dispersal, resilience and the geo-ecological processes related to tree, grassland and under-story functioning and of their interactions with pathogens, is needed for assessing resilience and to adapt management of the system in response to the influx of potential diseases and/or threats of climate change.

Also, the negative effects of pests and pathogens are increasing globally, due to a combination of climate change and increasing globalisation (Liebhold et al., 2012). For example, the invasive pathogen Hymenoscyphus fraxineas (causal agent of ash dieback) is currently causing widespread mortality of Fraxinus species in Ireland, and will undoubtedly lead to extirpation of several species that are associated with Fraxinus (Mitchell et al., 2014). While there are international regulation in place to discourage the spread of the most threatening pests and pathogens to plant health, it is generally accepted by scientists that these regulations are not fit for purpose (Roy et al., 2014). There has been a recent interest in building resilience against pest and pathogens into agricultural ecosystems (e.g. Telford et al., 2015), thereby providing a capacity for the ecosystem to survive any single pest or pathogen introduction.

Thus it is possible that by introducing agroecology principles, as well as establishing silvopasture systems with the correct tree species in the appropriate place in regard to environmental pressures and emerging invasive tree pest and pathogens, silvopasture could enhance the resilience and sustainability of agriculture (largely based on permanent grassland). Therefore, agroecological principles could address biological and spatial interactions between tree species, grassland and pest and/or beneficial species which could lead to an agroecological based pest management approach,–enabling development of improved sustainable agricultural production systems in the island of Ireland.

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Some key research questions about the interest of animal diversity for the agroecological transition of livestock farming systems

OLLION Emilie

Some key research questions have been investigated in order to produce actionable knowledge about the potential of diversifying animal resources for the agroecological transition of livestock farming systems.

Agroecological principles emphasize the role of agrobiodiversity as a resource to improve sustainability of agricultural systems, notably by enhancing the capacity of the systems to face disturbances (Altieri et al. 1999, Biggs et al. 2012). Regarding livestock farming systems, the interest of diversifying plant resources and especially pasture resources, has been largely explored by scientists (Duru et al. 2015). The diversity of the animal component of livestock systems is newly raising scientific interest. Even if in its principle agroecology claims animal diversity as a lever to adapt to climate change and prices instability (Dumont et al. 2013), few research studies provide insights on the real potential of managing animal diversity for the agroecological transition of livestock farming systems.

This poster outlines some key questions carried out by livestock farming systems researchers to test if the animal diversity can be managed to facilitate the agroecological transition of livestock farming systems.

The first set of research questions aims at identifying real farming systems based on animal diversity and characterising their functioning and assessing their whole performances. Here, animal diversity results from mixed herd diversity, within herd diversity and management practices of diversity. These researches have been grounded mainly on the analysis of farmers' real management practices gathered by interviews (Mugnier et al. 2014, Cournut et al, 2012) and herd performances from milk recorded (Magne et al., 2016) or trial dataset (Ollion et al. 2016). They already permitted to produce knowledge on the main management practices associated to livestock based on inter and intra-herd diversity and propose farming system analytical frameworks integrating animal diversity. The second key research question deals with the link between animal diversity and the adaptive capacity of livestock farming systems. Based on farmers' management practices and strategies analysis or livestock farming modelling these studies show that animal diversity is poorly used by farmers to adapt to uncertainties compared to plant resources (Cournut et al. 2012, Martin and Magne, 2015). They also provide methods to analyse the adaptive strategies to global change (climate / prices) based on animal diversity (Martin et al., 2017, Sabatier et al. 2017). The third kind of question focuses on the transition from specialized towards animal diversity-based livestock systems. The very few studies that have addressed this question, characterized different transition pathways and showed that the transition period is critical for farm management and performances (Basset, 2016). Ollion et al., (2015) also stressed that there are several sociotechnical locks-in to the transition towards animal diversity based systems such as professional norms, breeder organisations…

Researches in these three areas of inquiry are needed to formalize a framework for the analysis of diversified livestock systems and to develop tools helpful for farmers and their advisers to co-design and manage livestock systems based on animal diversity.

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Managing Crop varieties data: an app for on farm data collection

ORTOLANI Livia

The choice of plant varieties to grow in each environment is one of the key issue in agroecology, the development of a database with characteristics of plant varieties could support the choice of individual farmers. Intellectual property rights are a key issue to be taken into consideration in the management of such databases.

The increase of diversity in farmers' fields and the use of intraspecific diversity as management strategy to reduce the use of chemicals and to improve nutrition require an extensive knowledge of different varieties behaviour in term of response to biotic and abiotic stresses in several locations and in several years.

Farmers, technicians and researchers working on the dynamic management of agrobiodiversity in low input sustainable farming systems have a key role in the maintenance and continued evolution of such diversity. They are often organized in networks that promote dialogue, experimentation and collaboration between farmers as well as synergies with other actors of the food chains and with researchers.

Working on locally adapted varieties and genetic material seed networks manage important data regarding varieties and persons managing such varieties with a high level of details for their own network. In particular they could store information about varieties and their use by farmers in different areas and years, about the farm and agro ecological conditions of the farm and about traditional knowledge linked to the variety.

The CAPSELLA project is working for the identification of ICT tools that could link data on varieties with data on soil or climatic information would allow to connect and find the right correlations between varieties and climatic zones, representing an important example of integration of farmers' knowledge and quantitative environmental data.

The identification of an ICT tool to manage a database of varieties, users, farmers and farms with the information coming from experimental fields will be the base to organize data from on farm conservation experiences. Once organized, those information should be combined with soil and climate data.

Privacy and restricted access to data on genetic resources, landraces and traditional knowledge are perceived as extremely important by farmers. Variety data collected by seeds networks are not for commercial use. This aspect should be taken into consideration in the development of the ICT tool that could be suitable for farmers.

Storing information about seed circulation and varieties performance is paramount to make the right choice of the varieties to grow in each environment and according to local needs. The outcome of the CAPSELLA project concerning seeds will be the development of an app that will allow to manage data from on farm experiments and participatory plant breeding programmes.

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UK Farmers' Transitions to Agroecological Systems:
What Route to Redesign for Agroecosystems?

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Redesign towards agro-ecosystems is 'the game-changer' in meeting sustainability challenges, but this cannot be achieved simply by experimenting with efficiency or substitution measures.

How do farmers make a transition from conventional to agroecological practices? What support measures facilitate such a transition? To answer these questions, a small research project in the UK interviewed 14 farmers, selected for their practices which could lead to an agroecological transition. In the policy context in the UK, 'agroecology' per se has no defined support measures, though some relevant practices can gain subsidy through agri-environmental measures in the Rural Development Programmes.

For an agroecological transition, one model identifies three stages: Efficiency Substitution Redesign (ESR; Hill, 1985). This model has been widely used in the context of Agroecology (e.g. Lampkin et al, 2015; Nicholls et al., 2016). In particular:
(i) Efficiency starts by adopting more efficient use of inputs; (ii) Substitution replaces harmful technologies or inputs with benign ones; (iii) Redesign, where agro-ecosystems reduce the need for inputs in the first place. A system redesign based on ecological principles will more likely reach a sustainable end-point (Nicholls et al., 2016).

In our case-study farms, all three ESR categories were present, but they were not always sequential. On-farm experiments featured efficiency and substitution measures, which were important for farmers' experimenting and learning about different agronomic practices, e.g. intercropping. When some farmers shifted to a redesign, however, this did not always follow from efficiency and substitution measures. Redesign can involve several major changes, e.g. integrating livestock with arable agriculture, or planting trees for a biodiverse agroforestry; their separate effects cannot be readily monitored or compared to conventional farms. Redesign towards agroecosystems is 'the game-changer' in meeting sustainability challenges (Pretty, 2016), but this cannot be achieved simply by experimenting with efficiency or substitution measures.

Farmers' biggest challenges include the following: various issues related to people (self-beliefs versus problems with staff and negative attitudes of other people), technical issues (failure to establish of crops and trees, problems with silage or weeds such as black-grass), financial problems (access to finance, cash-flow problems, rejected grant applications) and some problems with the organic regulations. For state support measures, the grant criteria were mis-matched with some agroecological practices, especially when farmers 'think outside the box', so they were deterred from submitting applications.

From that analysis of motivations and trajectories, several implications follow for support measures.

- Agroecological transition is an active learning process, so support measures should facilitate farmers' inspiration, active learning and thus self-confidence in agronomic expertise.

- Farmers need to be inspired by seeing operational agroecological farms and participating in peer-to-peer knowledge exchange.
- Farmers need financial information about the likely impact of change, e.g. from reducing their inputs and increasing income through quality certification.
- Farmers need methods to measure their success and monitor their progress in relation to long-term financial resilience and environmental sustainability.
- Farmers should have access to grant schemes that support the public goods delivered through a whole-farm transition process to agroecological practices, initially in the start-up but also in the longer term. It is important to identify and overcome the mis-match with grant criteria.

Most support measures promote efficiency and/or substitution practices, with no clear route to redesigning a farm around agroecosystems. Therefore such a whole-farm transition needs extra support and incentives.

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High Value Tree Agroforestry Systems in Europe: from tradition to modern environmental and socio-economic needs

PANTERA Anastasia

High value tree agroforestry systems are diverse and have a great potential.

Agroforestry can be defined as "the integration of woody vegetation (first component) in at least two vertical layers on land, with the lower layer delivering an agricultural product such as crops or forage/pasture (second component) which may be consumed by animals (third component). With a recent EU research project called AGFORWARD, "agroforestry for high value trees" was used to describe systems where farmers were integrating vegetables, arable crops or grazed pasture amongst existing high value trees. These involve, among many others, apple, orange, chestnut, walnut and olive trees. Agroforestry involving fruit, olive and nut trees covers about 1.05 million hectares, corresponding to about 0.2% of the territorial area in the EU, and this area would be larger if it included other high value tree agroforestry types as well, such as those for timber production. Within the project, ten stakeholders groups were created across different European countries to promote these systems and trials and experiments were conducted to investigate the interaction of the different tree species with crops and/or livestock in terms of productivity, growth, pest control and ecosystems services delivery. The opinions of stakeholders involved in the various options were recorded and analysed.

The grazing of apple orchards using sheep was studied in the UK and France. Using sheep in cider apple orchards, where tree branches have been pruned to a height of at least 1-2 m, can offer production and financial benefits. Similarly, there were positive interactions from livestock grazing in high timber value walnut plantations in Spain. Grazing and pollarding in France ("bocage") is, in terms of productivity, a successful traditional agroforestry system. In Spain, hardwood species are commonly grown using rotations of up to 50-60 years, and the establishment of a legume based mixed pasture understorey grazed by sheep, provided financial and environmental benefits. Agroforestry based on chestnut trees is a traditional land use system in North-west Spain, in Switzerland and Greece, in which pasture is mostly grazed by pigs (Spain) or sheep (Switzerland) and sheep and goats (Greece). Chestnut woodlands are also an excellent habitat for the commercial production of edible mushrooms. Orange trees are traditionally intercropped with vegetables in Crete, Greece, after the trees are pollarded to change varieties by grafting and before full growth of the tree crown. Olive trees, one of the most characteristic Mediterranean species, are intercropped with cereals in Macedonia, Greece, but can also be successfully used to grow wild asparagus or cut flowers. They are also traditionally grazed by livestock, comprising mostly sheep and, less frequently, goats. These systems incorporating crops or livestock amongst existing orchards and tree stands across Europe highlight the diversity and the production and environmental benefits of High Value Tree agroforestry as a sustainable, multifunctional land use system.

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Agrotopia: a research and training centre on Agroecology

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Agrotopia has 3 key activities:

- *Designing and developing agroecology and permaculture practices in the field.*
- *Training project leaders through courses introducing them to these practices.*
- *Supporting course participants right through to their project implementation by personal coaching.*

AGROTOPIA 's mission is to contribute to the emergence of new agroecological initiatives through research-development, training and coaching of project leaders. The objective is sharing agroecological practices with project leaders who can then put them into practice in their own context. AGROTOPIA offers a practical training based on solid scientific and technical basis. This training is first and foremost designed as a preparation for job creation in agroecological projects. It adopts a progressive approach for teaching agroecology. It is organised in 6 key modules:
Level 0: Foundation and perspective/The basics of agronomy
Level 1: The basics of agroecology
Level 2: Advanced
Level 3: Practitioner
Level 4: Certified instructor
Level 5: Project coaching
AGROTOPIA's general course is a holistic programme. It emphasises the acquisition of knowledge through practical learning including observation of real-life situations, practical exercises, agricultural work, and the design and development of projects, by incorporating the theoretical basis according to participant's needs. Knowledge is acquired through iterative learning. Participants' project is central and develops as knowledge progresses. This is very much in contrast to a linear learning structure, organised by individual topics, that possibly leads to a project design. Each participant can thus clearly understand at all times the reason for attending the training course, since it is intrinsically linked to his/her individual project. When required, instructors give theoretical lessons, presenting topics in a concise manner, with suggestions for further individual reading. Participants can then discuss the reading matter further with the teacher in individual coaching sessions. An individual coaching service is available throughout the various training levels.
AGROTOPIA offers also a framework favourable to learning and practical work. Agroecological arable crop and livestock farming, permaculture vegetable gardens and orchards, and greenhouses at Famelette farm are used intensively to provide participants with applied knowledge during the practical exercises of these courses.

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An action-research programme on the design and development of agroecological systems in farms

PEETERS Alain

An action research programme aims at developing in a holistic way agroecological systems in commercial farms in North-West Europe (Belgium and France).

The ecological strategy of these agroecological systems consists in replacing fossil fuels by ecosystem services provided by biodiversity. Inputs that require large amounts of fossil fuel for their production such as inorganic nitrogen fertilizers, pesticides, and imported animal feed are totally replaced and machine fuels partly. This is achieved by investing in biodiversity at all levels from soil to landscape and even in production types and people involved in large and micro-farms and working together in a collaborative way. The system relies on local resources, for instance on the endogenous soil fertility, and not on massive use of commercial inputs.

Soil biodiversity is first enhanced by stopping soil life destruction by inversion tillage and power harrows. Then soil life is fed by temporary grasslands, biomax (complex mixture of soil cover used as intercrop), permanent soil cover, crop residues and FYM. This induces a fast development of soil micro-organisms and earthworm populations. Diversification and enhancement of soil micro-organisms populations contribute to improve soil structure and to form a fertile and disease suppressive soil. Legume-based temporary grasslands and biomax increase carbon storage in soils and fix nitrogen that is partly available for the other crops.

During the transition phase towards agroecological system, the ecological network is developed or reinforced by dividing existing plots into narrower plots split by thin herbaceous strips. These strips are designed for increasing populations of natural enemies of crop pests. The ecological network is completed by species-rich hedges, isolated trees, small woodlands, ponds, etc. Disease and pest occurrence is also reduced by the choice of resistant species and cultivars, long and diverse crop rotations, and measures for creating a disease suppressive soil.

Weeds are controlled by a combination of means among which temporary grasslands and biomax are the most important. Some crops are directly sown in biomax mulch that prevents weed establishment. Weed control is completed by superficial soil works when necessary. Aggressive cultivars and crop species are also preferred.

Nitrogen is provided by a large and systematic use of annual and perennial legumes. Legume-based temporary grasslands, legume-based intercrops, and pulses are spread in the crop rotation in such a way that a non-legume crop follows a legume-based crop. The necessary use of temporary grasslands and their associated forage productions makes the presence of livestock almost indispensable in the system.

Fuel consumption by agricultural machines is significantly decreased by the reduction of soil work, including by the abandonment of inversion tillage that requires a lot of energy.

Compared to conventional systems, the ecological strategy of agroecological systems makes the system more resilient to climate change and mitigates climate change by reducing GHG emissions and by storing carbon in soils and vegetation.

The economic strategy consists in reducing as much as possible investments and variable costs and in increasing selling prices by targeting high quality products sold in short and local marketing chains, by product processing whenever possible, and by a smart diversification of activities. The system does not look for maximum yields but for good income. Compared to conventional systems, this approach induces similar or

higher income, and makes the system more resilient to price volatility on the world market. It produces also higher farmer's and farmer family welfare.
The efficiency of these strategies is assessed by the follow-up of indicators recorded in scientific studies. Ecosystem services provided by biodiversity are sufficiently efficient for inducing an income which is higher than the average income of arable farms in the same regions.

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Agroecological principles and practices for grass-based farming systems – Book chapter

PEETERS Alain, WEZEL Alexander

Agroecological principles and practices were mainly defined for cropping systems, market gardening, and permanent crops, less so for livestock and grassland-based farming systems. This book chapter is an attempt to do it.

The chapter defined seven groups of agroecological principles and seven groups of practices.
Chapter extract: 'Regarding principles, any development process of agroecological systems should recognize the central role of farmers and should associate farmers in holistic and participatory approaches. Agroecological systems should be locally and culturally adapted and should empower farmers by making them less dependent on commercial influence and input use. Agroecological systems are based on all biodiversity types, at all scales. They carefully manage natural resources such as soil, water, atmosphere, and energy. Biodiversity make use of these resources for providing ecosystem services that may replace fossil fuel use to a large extent, for instance by legume symbiotic nitrogen fixation. Livestock farming can ideally be incorporated into mixed crop-livestock systems but specialized grazing livestock systems could also be sustainable. Animal health management is also an important component. Agroecological systems should be 'economically viable', 'liveable', 'inheritable', 'socially equitable' and environmentally sound. They should also be resilient to environmental and economic crisis. Moreover, these systems should provide optimum quantity of healthy and tasty food for citizens and a large diversity of food to local population. And finally, they should develop a new harmony in human societies by linking closely farmers to consumers.
Regarding practices, legume-based grasslands and multiple species swards should be the pillars of agroecological herbivore systems. Their management should be adapted to grassland plant and animal needs. Grazed grasslands should be preferably managed in rotational stocking. Stocking density should be high and plot sward height well controlled at the entrance and the exit of animals. Rest periods can be long thanks to the high legume proportion in swards. Different grassland types can be managed according to the needs of different animal types.
The structure of livestock systems should be designed by a holistic approach where animal breeds are chosen and adapted to the system and not the other way round. Double-goal and rustic breeds should be preferred to highly specialised animals. Moreover, The management of domestic livestock farming should be inspired by the conditions prevailing for their wild ancestors.
Agroecological systems should reduce feeding costs by giving priority to feed, to grass mainly, compared to food, by extending the grazing season, producing high quality grazed and conserved grass and aligning young animal birth period with the beginning of the grazing period. The agroecological animal health strategy should be based on prevention methods, curative instead of systematic treatments, and disease treatments based on natural means.
The economic strategy of agroecological systems for increasing income includes (i) the reduction of investments and production costs (up-stream strategy), (ii) an increase of the value of products by the production of quality products, their processing, and their marketing in short, local or regional chains (down-stream strategy), and (iii) a diversification of productions and activities.

In general, food value chains are designed to be shorter in agroecological than in industrial farming. They are ecosystem-based and not fossil fuel-based. Production costs are reduced and a large proportion of profit is kept in farms. Since farmers and consumers are in close contacts, consumer trust is higher in product quality, and thus consumers are ready to pay adequate prices. Product processing usually creates jobs and local marketing reduce transport costs and energy.
The development of synergies between farmers and consumers/citizens (e.g. within the framework of Community Supported Agriculture) often contributes to increasing and stabilizing farmer's income, and to providing quality food to consumers at a reasonable price.'

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The use of Participatory Action and Learning for Agroecology: conducting research on living mulches in central Italy

PELLEGRINI Fernando, ANTICHI Daniele, CARLESI Stefano, LAZZARO Mariateresa, NARDI Giacomo, BARBERI Paolo

Participatory Action and Learning methodologies help adapting the innovation to the local socio-economic conditions and allow the stakeholders to have a say in the topic of interest, thus bridging the gap between academia and practice.

Living mulches are considered an interesting option in the agroecological transformation of farming systems. Despite the fact that many academic studies have demonstrated their benefits in terms of weed control and soil fertility, farmers in Italy are still not applying this technique. A major challenge is in fact to implement novel practices in a complex agricultural world, where multiple and sometimes contrasting views arise. Our aim was to study the socio-economic conditions related to living mulch application, and to create the first Participatory Action and Learning research group in the area. We set up two farm trials to test different living mulch options for common wheat, and we organized focus groups with the stakeholders with the objectives of defining the trial treatments and periodically assess the results. We followed a Soft Systems Methodology to define the system's boundaries and entry points, and we used the Kolb's learning cycle as a monitoring tool during the research work. We found that our farmers prefer to adopt innovations using a step-by-step approach, and would adopt living mulch if this practice does not interfere with their economic objectives, and especially if it does not increase the complexity of the farming process. Some farmers are still looking for a solution that does not substantially diminish the yield potential, while some others are more interested in the grain quality potential offered by the living mulch technique. Farmers were able to steer the research process according to their own necessities and came up with interesting personal intutions about future research perspectives. Farmers often do not have information on weed management due to the lack of public extension services, and they are undergoing a process of fragmentation. As a consequence, farmers are usually left out of decisions regarding agricultural innovations, hence they considered participatory group activities as important moments for their personal learning process. This experience provides a good indication that universities and extension services need to incorporate more participatory approaches in their agenda, especially when adoption of novel, environmentally friendly practices is sought. Activities that encourage the creation of networks of farmers, technicians and consumers may foster innovation in agriculture.

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Fostering legume presence in cropping systems: co-evaluation of agroecosystem services

PELLEGRINI Fernando, ANTICHI Daniele, BARBERI Paolo

Agroecosystem services linked to legume presence in cropping systems can be better valued and fostered through a participatory approach.

LEGVALUE is a brand new research project (start: 1 June 2017) funded by the EU Horizon 2020 Framework Programme, aiming to foster sustainable legume-based farming systems and agri-feed and food chains in the EU. LEGVALUE includes 24 on-farm networks across Europe, where an assessment of legume yields and production-related agroecosystem services supplied by legume-based cropping systems will be performed. This assessment will take into account the diversity of species (grain and forage legumes), crop management and rotations, and will be based both on previously available data and on new data generated in the project. The agroecosystem services assessed will e.g. include improved soil fertility and biological pest control, which will result in reduced fertiliser and pesticide use on the legume crops and on the following crops. Simple quantitative indicators linking legume presence in cropping systems with the provision of targeted production-related agroecosystem services will be used. Other relevant indicators prioritized by local actors (farmers, advisors, food processors, consumers) will be identified through surveys and collective testing throughout the project. This will result in specific indicators to assess ecosystem services that will be gathered in a fine-tuned locally-adapted assessment tool. Every on-farm network will have their own local multi-actor group, which will be engaged in participatory work with scientists according to a four-step methodology: (i) co-definition of hierarchized targeted agroecosystem services expected from legumes, (ii) co-definition of a set of indicators to assess the provision of agroecosystem services, (iii) collection of data from past and on-going experiences, (iv) joint analysis of results and synthesis through SWOT analysis. This approach will be common to all on-farm networks but the set of indicators may differ among them depending on the priorities established. These information will feed a database linking agronomic, technical, economic and environmental indicators, calculated in farm networks, with overall system performance as to the provision of agroecosystem services.

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Conventional and participatory mapping as a tool for decision-making. Case study on ecosystem services in a rural area of Spain.

PÉREZ-RAMIREZ Irene, GARCÍA-LLORENTE Marina

Participatory mapping of farming ecosystem services aims to collect the diversity of stakeholders' knowledge and empower people to participate in spatial decision-making issues.

Agroecology as an interdisciplinary science needs methods that combine tools of the social, environmental and agronomic sciences in order to perform triangular studies that are based on the interaction of the different visions of knowledge. This study takes place in the southeast of the Community of Madrid, in the so-called Las Vegas Rural District. This case study analysis the importance of food production as a provisioning ecosystem service from the biophysical and social sides in two different stages. In the first phase, from an agricultural agronomic perspective, food production was accounted since the last decades using spatial explicit data. In a second stage, the social and cultural perspective, which generates alternative visions on the territory, on the productivity, soil fertility, water supply and sense of belonging, were analyzed. This phase was carried out through five participatory mapping workshops (N=62 participants) with the aim of bringing together the diversity of stakeholders' knowledge, reflecting on issues of mutual interest and allowing people to participate in decisions about their territory. The process of participatory research generates a dynamic reflection of the historical evolution, the current situation and the needs of local populations. We hope that the integrated analyses of both information sources (biophysical data and social data) could help to promote social processes of change, within the methodological framework of agroecology.

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What role for researchers in supporting agroecology as a path to food sovereignty?

PIMBERT Michel

It is noteworthy that the more transformative agendas for agroecological research are mainly championed by the food sovereignty movement in Europe and elsewhere. The food sovereignty movement seeks to actively develop more autonomous and participatory ways of producing knowledge that is ecologically literate, socially just and relevant to context and dynamic complexity. This implies a radical shift from the existing top-down and increasingly corporate controlled research system, to an approach which devolves more responsibility and decision-making power to farmers and citizens for the production of knowledge on agroecology and sustainable food systems. This paper highlights some of the roles which researchers can play in bringing about this paradigm shift, - and under what enabling conditions. Particular emphasis is placed on reversals needed to develop professional attitudes, behaviours, and participatory skills to engage in more power-equalising research with wo/men farmers, farm workers and citizen-consumers. Wider enabling structural and cultural changes in the organisation of agricultural research and development (R&D) are also briefly presented along with two possible complementary pathways for future agroecological research and innovation in Europe 1) Democratising science and technology research, with increased funding for public research; and 2) De-institutionalising research and supporting horizontal networks for self-managed research and grassroots innovation.

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Bacteria and fungi in agricultural landscapes: almost invisible but the engine of plant production

PIRHOFER WALZL Karin

Natural habitat patches in agricultural landscapes can be a source of microbial communities that support crop growth.

Background:
Industrial agriculture focuses mainly on provisioning ecosystem services, like yield. This leads to a decrease of microbial diversity (including arbuscular mycorrhizal fungi) and related services, e.g. regulation of water and nutrients. The estimated annual ecosystem service of soil organisms worldwide is at 1.5 billion US$. In the European research project BASIL (Balancing Agroecosystem Services In Landscapes) our goal is to balance ecosystem services for maximal environmental and socio-economic sustainability in agricultural landscapes. One of our research questions is: can natural landscape elements such as in-field ponds and hedgerows be sources of microbial diversity that re-colonize intensively managed agricultural soils?
Method:
On farmer fields in Germany and Spain we determined soil microbial diversity and arbuscular mycorrhizal fungi root colonization along transects which started at natural habitats and ended 50 meters into the agricultural field.
Main outcome:
→ Arbuscular mycorrhizal fungi root colonization and fungi diversity decreased along transects from the edge of the agricultural fields bordering natural elements to 50 m into the winter wheat fields and AMF root colonization differed between transects starting at in-field ponds, hedges and neighboring agricultural fields.
→Bacteria diversity, shoot biomass and grain yield increased along transects from the edge of the agricultural fields bordering natural elements to 50 m into the winter wheat fields
→ Natural habitat patches in agricultural landscapes can be a source of microbial communities that support crop growth. More detailed knowledge about the microbial communities from DNA analyses will help to link the diversity with functions. Furthermore, we aim in our research project to balance microbial processes that are linked to crop growth and yield. This may help to improve environmental sustainability of agricultural landscapes.

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Ten Year For Agroecology (TYFA) – a scenario exercise exploring the feasibility of an agroecological Europe

POUX Xavier

TYFA as a scenario study shows that the generalization of agroecology at European level is technically credible and socially desirable, though demanding.

TYFA is a scenario exercise exploring the assumption of generalised agroecology at European level, at horizon 2050.
It stands on a multidisciplinary analysis crossing agronomical assumptions and economic, social and political approaches.
The fundamental assumption is a socio-political deal leading to the ban in the use of pesticides, considering the rising impacts on human and ecosystem health – leading to rising public and private costs - and the impossibility to safely deal with a shaky compromise in terms of "acceptable reduced doses". This socio-political entry point puts TYFA in a European Union perspective, with strong policy implications and ambition.
TYFA explores how agroecology can address this challenge. As a scenario exercise, it stands on the following packages for the description of a plausible 2050 image:

- A consistent definition of generalised agroecology at European level. In short, it consists in the combination of organic farming requirements with strong biodiversity achievements (ecological focus areas, permanent pastures, agroforestry, crop rotations)
- Assumptions on consistent land-use at EU28 level, resulting from the combination of different types of crop rotations in different contexts and from assumptions of a desirable share of permanent pastures at Nuts 2 level.
- Assumptions on plausible yields, quantifying consistent N balances in different agrarian situations (checking that N supply meet the crop needs)
- Resulting from the two previous points, assumptions on the use of different types of crops (cereals, protein crops and legumes, oil crops, permanent crops, permanent pastures, etc.) for food and feed purposes at EU level.
- Assumptions on trade (exports of cereals, imports of tropical feed, giving-up of soya import resulting from assumptions on rotations with a high share of N fixing crops)
- Assumptions on a generalised human diet compatible with the levels of outputs resulting from the above assumptions. Compared with the present situation, this diet consists in a significant reduction in the uptake of diary and meat products and an increase in food from vegetal origin. It results in a lower energy-rich diet, meeting the standards of a healthier and more balanced food.

This quantification exercise has been based on an extensive analysis of the 2010 situation, compiling different databases in terms of land use, food/feed balances, productivity levels, N and energy flows, diet.
Alongside the core quantification, TYFA also addresses significant socio-economic issues apprehended in qualitative terms: the social and economic rationales supporting the EU agroecological project; the consequences at farms and territory level; the likely consequences in terms of food chain organisation; the policy implications.
Like all scenario exercise, TYFA does not pretend to predict what will occur in the future. Its purpose is to feed the political debate with a proposition image at a time when the future of the CAP is put on the table and when wider social movements questions the need for a more sustainable agriculture. Compared to other similar works (e.g. Afterres 2050) progress of TYFA stands in the exploration of the question "can agroecology feed Europe in future?" through a quantitative analysis — as far as we know, there is no other similar exercise for organic farming at this level. It also tends to analyse how it is not

only a possible option, but a desirable one for a large set of actors. However, agroecology entails fundamental and demanding changes for big companies (organisation and business model), politicians (risk assessment,…), farmers (farm management, risk management, collective organisation) and consumers.

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Malagasy farmers' view on the use of *Stylosanthes guianensis* for weed management in no-till rain-fed rice cropping systems

RAFENOMANJATO Antsa, AUTFRAY Patrice, BARBERI Paolo, MARNOTTE Pascal, RIPOCHE Aude, MOONEN Anna-Camilla

Stylosanthes, a cover crop that supresses troublesome weeds

Upland rice-based cropping systems in the Mid-West of Madagascar suffer from low soil fertility, and weed pressure further reduces the already low yields of 1.5 - 2 t/ha. About twelve years ago, an agroecological practice based on a no-till system with *Stylosanthes guianensis,* a cover crop used as a live mulch, was introduced. This system has been proved to enhance soil fertility but its effect on weed community was not yet studied. Thus this research focuses on the effect of stylosanthes on weed infestation. In the administrative units of Ankazomiriotra and Vinany, interviews and focus groups were performed with 40 farmers. The aim was to map farmers' knowledge of and opinion about weeds and stylosanthes. According to farmers, most dangerous species were *Striga asiatica*, *Richardia scabra*, *Eleusine indica, Digitaria spp.*, *Cleome hirta* and *Cyperus spp.,* due to their capacity to reduce crop yield and the difficulty to eliminate them from the field. The general perception is that weed abundances decreased in the system with stylosanthes. Furthermore farmers feel that *S. asiatica* problems are less pronounced in this system, which is in line with the general knowledge that this hemi-parasitic weed decreases in more fertile soils.

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Agroecological practices impact positively on farms carbon footprint. Itasy Region, Madagascar

RAKOTOVAO Narindra

Agroecological practices adopted in Highlands Madagascar improved farms carbon footprint

Carbon footprint (CF) of smallholder farms in central Madagascar was assessed to offer key information on greenhouse gas (GHG) emissions and carbon removal capacity of agricultural farming system. We selected 192 representative farms of the Itasy region to conduct this work. We took into account the three main GHG encountered in the agricultural sector: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The annual balance of all emissions and all captures of GHG associated to farm activities was considered as carbon footprint of each farm. The 192 farms were classified in four groups according to their level of agroecological practices adoption, which are (i) tree planting in forestry or agroforestry system, (ii) organic matter composting from manure and crop residues and (ii) intensified rice system which alternates drought and flooding period. GHG emission and capture factors the most adapted to central Madagascar conditions were used for calculation. We elaborated a calculator called TropiC Farm Tool in Excel, adapted to farm scale and highlighting smallholder's activities to calculate farm CF. Results showed that the adoption of agroecological practices reduced farm CFs up to 300%. Nitrous oxide from soil management (25%), Methane from rice cultivation (24%), livestock manure management (24%) and livestock enteric fermentation (23%) were the main source of GHG whereas carbon stored in woody biomass (56%) and carbon returned in soils from organic fertilizers (44%) were the main sink of GHG at farm scale. This study highlights that the integration of agro-ecological practices at farm scale offers significant GHG mitigation and carbon sequestration in Malagasy context, thus giving an alternative for climate change mitigation.

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Agroecological Innovations for Resilience and Sustainability of Alpine Livestock Farming Systems (INVERSION)

RANALDO Marzia, CARLESI Stefano, BARBERI Paolo

The co-participation of farmers and researchers to the achievement of sustainability objectives is the way to go for a successful agro-ecological transition in livestock farming systems.

In the Alpine area of Giudicarie Esteriori (Trentino, Italy), livestock and dairy farming have been the backbone of the socio-economic development. In recent years, the productive system has deeply changed towards an intensification and industrialization of the farming process. The number of livestock per farm has increased while the pasture land utilization has decreased, resulting in a severe deterioration of animal welfare and natural resources. The use of external input has dramatically increased over time, making the livestock system in this area economically and environmentally unsustainable. A radical change is needed to allow the survival of livestock farming in this region, to prevent land abandonment and dramatic environmental damages. A group of farmers decided, with the help of scientists and professionals, to start an agro-ecological transition towards a more economically, environmentally, socially, and ethically sustainable livestock farming system.
A participatory approach is implemented in the project INVERSION (within the framework of the Rural Development Programme, Autonomous Province of Trento). This methodology involves five steps: i) definition of common priority needs and key agroecosystem services for the farms and for the territory, ii) co-definition of agro-ecological practices to be implemented in the farms, iii) co-definition of the best indicators to evaluate performances of practices, iv) co-evaluation and adaptive adjustment of innovative practices through a reiterative process, v) adoption of the tailored and successful agro-ecological practices and dissemination of information and scientific results.
The adoption of agro-ecological innovations at the system level will allow to achieve several objectives: i) increase profitability of farmers through the reduction of external inputs for animal feeding; ii) increase resource use efficiency; iii) increase animal and plant biodiversity through diversification of the productive system; iv) achieve the optimal level of animal health and welfare; v) increase agroecosystem services (provisioning, regulating, supporting and cultural services) provisioning through functional biodiversity; vi) increase soil fertility; vii) contribute to mitigation and adaptation to climate change; viii) improve farmers technical, organizational and managerial skills, and knowledge; ix) provide consumers with high quality products.

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Food startups with an agroecological twist in Hungary

RETHY Katalin

Many small food related companies have started operations in the recent years in Hungary, especially around the capital Budapest. Although the owners don't necessarily define their operations based on agroecology, many attributes contribute to understanding them in the context of food system level agroecological approaches, such as:

- Supporting small scale, diversified agricultural systems
- Shortening food supply chains, bringing closer producers and consumers
- Applying innovative methods in production and distribution
- Contributing to environmental and social benefits

Compared to more traditional food ventures; these food startups in Hungary show innovative approaches both on the level of food production, marketing and distribution. Some of these innovations are imported, such as farming operations based strictly on the French AMAP system, while others show innovation in technological approaches; or a diversified produce palette.

During the 'impulse', some of these companies will be introduced shortly:

- Magosvölgy Ökológiai Gazdaság (AMAP- system farm)
- Szezon Kert (Diversified vegetable, edible flower production and wild goods)
- YouTyúk (Leasing based egg production and distribution)
- Házikó Bisztró (Restaurant and catering)
- Az én piacom (On-line and warehouse based distribution)

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A participatory method for farm scale scenarios in order to preserve and/or restore groundwater quality

RICHARD Annabelle, CASAGRANDE Marion, JEUFFROY Marie-Hélène, DAVID Christophe

There is an increasing societal pressure on agriculture to limit groundwater pollution caused by the use of synthetic pesticides and fertilizers. From EU Nitrate directive, agro-environmental program should be applied on sensitive water catchments. In France, these programs, including a set of measures, are generally not suitable for farm management and not sufficient to preserve or restore groundwater quality. Then, there is a crucial need to foster agroecological innovations that take into account local ecological regulations and rely on farmers' innovations capacities. In this context, we developed a participatory approach exclusively with farmers. The method was applied on 2 case studies located in South East of France. The objective was to co-design scenarios that encompass farm management and farm structure, and support adapted agroecological practices, to enhance water quality. Each scenario is a combination of different farm management changes *i.e* cultural practices and/or cropping systems and/or material or human resources. It involved rounds of workshops with individual and groups of farmers. The proposed scenarios have been evaluated in terms of environmental, agronomical, social and economic performances, their consistency with regard to the farmers' objectives and their efficiency to reduce pressure on groundwater quality.

Our results show that farmers have efficiently designed scenarios that are suitable for farm management diversity in catchment area. This approach tailored individual solutions predicated by collective expertise. This "bottom-up" approach fosters involvement of farmers in a participative process, and should favour further scenario implementation to protect/recover groundwater quality. This generic method can be used by local stakeholders in order to facilitate the development of catchment-specific programs including measures suitable for farm management diversity and assumed to protect/recover groundwater quality.

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Outscaling innovative practices on farm: promising approaches to foster the design of agroecological farming systems

SALEMBIER Chloé, SEGRESTIN Blanche, WEIL Benoît, MEYNARD Jean-Marc

This work sheds light on original approaches that agronomists, from different R&D bodies, developed to outscale farmer's innovative practices, in the aim to foster the design of agroecological farming systems.

Over the past decades, the idea that farmer's knowledge is a precious resource to foster the development of agroecological practices in agriculture has gained currency (Altieri, 2002). For several years, agronomists are called upon to take account of farmer's knowledge, in particular in design processes (McCown, 2001). In that trend, we find an increasing number of initiatives, carried out by diverse R&D actors, aiming to outscale innovative practices developed on farm (Meynard et al., 2012; Herman et al., 2016). Even if these initiatives mushroom, we still know very few about how this outscaling process of farmer's practices is driven and how it can foster the design of agroecological practices.

This work aims to highlight why and how agronomists study innovative practices on farm and how do this work enrich design processes.

To explore this question, drawing on design and agronomic theories, we choose to drive a case study analysis (Eisenhart, 1989). In the French context, via semi-structured interviews with key actors coupled with document analysis, we studied fourteen programs, carried out by diverse R&D actors.

Our results highlight a panorama of approaches in agronomy, unknown until now. We show that agronomists invented different methods to spot, characterize and assess innovative practices on farm, and some of them developed original organisation models to interact with farmers at different stages of design processes. These agronomists all couple the study of innovative practices on farm with other knowledge production methods in agronomy (e.g. experiment, agronomic diagnosis, design workshops, etc.) and they invented knowledge-hybridization methods to generate local and/or generic outputs-outcomes for farmers and for other agronomists (e.g. Knowledge gaps). Our results demonstrate that studying farmer's innovative practices increases agronomist's design capacities, resulting in the generation of original outputs/outcomes for farmers (e.g. videos, written testimonies, knowledge added on forums, etc.), which all differ on the design capacities they offer to farmers.

This work sheds light on original forms of interaction between agronomists and farmers that could inspire others to support the design of agroecological practices.

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The role of agroecology in designing sustainable food systems: the experience of the periurban rural area of Gallecs (Barcelona, Catalonia)

SANS SERRA F. Xavier

The agroecological transition of the rural area of Gallecs is an example that the agroecology can generate economically sustainable agronomic models, socially just, and committed to future generations.

My proposal is a 10-minutes talk about the agroecological transition in the Area of Natural Interest of Gallecs, a periurban and rural area in the municipality of Mollet del Vallès, located 15 km north of Barcelona (Catalonia, Spain). We will present qualitative and quantitative data supporting that the agroecology is a suitable strategy to address the current problems of sustainability of the planet, by acting locally.

The Agroecosystems Research Group started in 2005 a participatory research process with the Agroecological Farmers Union of Gallecs and the Consortium of Gallecs, the managing body of the area, with the support of the Catalan Ministry of Agriculture, Livestock, Fisheries and Food, aiming to design a new agriculture management model economically sound and respectful with the environment in order to favour the biodiversity, to protect and improve the soil quality, to recover traditional crop varieties which can guarantee food quality, and foster farmer's association in the frame of periurban agriculture.

In 2005, after the conversion into organic farm management, we started the monitoring of 18 pilot fields, and we added three more fields in 2006, ending up with 21 pilot fields (around 41.07 ha). We monitored the farm management of each year, the arable weed species cover and diversity and the characterisation of the soil nutrient content of these 21 fields the first year after the conversion (2006 or 2007), 5 years after (2010) and 11 years after (2016).

The conversion to organic farming increased the number of crops, from a monoculture of barley before 2005, to a total of 21 different cultivated species and varieties. The weed species richness increased by a 50 % in five years, from a total of 61 up to 122 species, although a slight increase of the abundance of weed species was observed. Despite that crop rotation design was relied on a sequence of cereal and legumes for human consumption, the incorporation of reduced tillage and the appropriate fertilisation with cow farmyard manure have been recognised by farmers as an important issue to improve soil quality and crop productivity.

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Plant biodiversity and weed control: comparison between organic and conventional systems under different cultural practices

SANTONI Margherita

Tillage operation and weeds control: increase of crop yield while taking into consideration agro-ecosystem biodiversity.

MoLTE is part of the experimental farm of Florence University, which is located in Montepaldi, San Casciano Val di Pesa, Tuscany, Central Italy, and it covers an area of about 15 ha, in a lightly slopped area, 90 m asl. The whole MoLTE experimental site is divided in ten fields of around 1,3 ha each. The MoLTE experiment started in 1992 and is currently still ongoing.
The fields are surrounded by semi-natural habitats composed by natural and artificial hedge, flower strip, spontaneous bushes and grass.
The experimental site is composed by differently managed systems, designed with the purpose of comparing organic and conventional management.
The organic systems operate on a 4-year rotation including Maize/Sunflower – Legume -Wheat/Barley – Legume, while for the conventional one a two-year crop rotation is used in which Maize/ Sunflower follows Wheat/ Barley.
The European project FertilCrop, started in 2015, will last for three years. The overall aim of FertilCrop is to develop efficient and sustainable management techniques aimed at increasing crop productivity in organic farming systems.
To achieve this, one of the aims of the project is to investigate the mutual interactions of crop plants with weeds and co-cultivated plants. Therefore, the experimental scheme was designed to test the effects of different types of tillage on this mutual interaction, in barley and sunflower crops. In particular, the study is based on how the tillage can affect biodiversity within the organic and conventional system, as well as to investigate crop response in terms of yield.
Species sampling was doing conducted within each field and at the field margin. These communities were sampled using two different methods. Inside the field the Raunkiær method was used; species density (number of individuals expressed per unit of area) and their biomass were assessed. Along the field margins, we used the transect method to evaluate the presence/absence of species. Biodiversity quality of the agro-ecosystem was evaluated using numerical indexes. Furthermore additional information about primary tillage operation and the interaction with weeds will be addressed.

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Crop Rotation Nexus

ŠEREMEŠIĆ Srđan

Redefining the concept of crop rotation to integrate the main crop, cover crops and intercropping by unraveling the outcomes to soil and crops.

Crop rotation has been used in agriculture for thousands of years, mainly because of yield-benefits obtain. Likewise, the extensive literature is written to validate the effects of crop rotation, as indispensable design in agriculture. However, for many scientists and farmers are difficult to comprehend the "crop rotation effect" since factor and mechanism responsible for yield increase are not completely understood. Therefore, there are still many uncertainties related to using crop rotation such as:

1. what and where to look for positive effects,
2. how many years it would take for accomplishment of beneficial results,
3. contribution of specific crops (variety/ hybrids of the same crop)
4. separation of crop rotation cumulative effects from the effects of combined climatic influence, etc

On the other hand pest, weeds and diseases occurrences are suppressed by proper crop sequence but they are repeatedly adapted to new conditions, while new (allochthonous) species could emerge and could aggravate interpretation of the positive effects of crop rotation. With the introduction of cover crops/intercropping/catch crops analysis of crop rotation systems becomes extremely complicated as many crops may interact in the outcome of systems. The fact is that crops exert most of their effects indirectly throughout the soil (crop residue, rooting depth, exudates, nutrient uptake...etc, and consequently resulted that crop rotation is less connection to crops but it largely depends on soil that may buffer performance of crop sequence.

There are many examples that some soil properties such as SOC, bulk density or microbial activity are sustained in a long-term monoculture compared with rotation cropping. Hence, Broadbalk Wheat Experiment (Rothamsted, UK) has continuous winter wheat from 1983 still produces yield. For the development of agricultural and food systems of tomorrow, it would be of great importance to make a distinction and clarify crop rotation concept. For example "crop rotation" could be redefined by downscaling outcomes with the following classification:

1. yield is increasing soil indicators are improving,
2. yield has not been improved but soil indicators are enhanced,
3. yield is increasing and soil properties were deteriorated.

Consequently, innovative crop rotation design in Agroecology should be developed and possibly tested to verify this approach. The revision must be also linked to the provision of ecosystems services, biodiversity, eco corridors etc. Finally, it would help farmers to design specific "crop polyculture systems" to embed into the local environment and meet their requirements.

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Fostering Transitioning: A Model of Facilitating Agroecological Practice Adoption in the US

SILVA Erin

Adoption of progressive agroecological practices on the landscape requires a strong educational approach that integrates farmers, University Extension educators, public sector educators, and private industry, within the context of markets and policy opportunities and limitations.

The adoption of agroecological practices is often a significant deviation from agricultural "status quo", requiring a shift in agronomic practice, marketing, and economic planning, as well as a social shift on behalf of the farmer. Unlike industrial farming practices, farming using agroecological practices substantially deviates from the "cookbook"/"recipe" approach which has become the dominant paradigm driving agricultural recommendations to conventional farmers. To better facilitate the adoption of more ecological driven management approaches, the University of Wisconsin-Madison (Madison, USA) has initiated a comprehensive farming training program called "OGRAIN" (the Organic Grain Resources and Information Network). This program integrates multi-faceted approaches to remove barriers to both existing and beginning farmers to adopt organic/agroecological practices, including diversifying rotations, integrating cover crops, accessing niche local/regional markets, promoting perenniality, and adopting low-input management approaches. The program has brought together numerous partners, including expert farmers, non-profit agencies, University Extension specialists, and industry partners. Education occurs through intensive classroom-based settings, videos, distance education, field walks, conferences, and mentorship program. This session will discuss the structure of this program, including successes and challenges over its initial two years of activities, and strategies for longevity of the program.

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De la souveraineté technologique des paysans : reflexions et perspectives

SINOIR Nicolas

De l'intérêt general autour des agroéquipements

L'outil de travail des agriculteurs, les agroéquipements (machines, équipements, bâtiments), sont au cœur d'enjeux agricoles majeurs. Le surdimensionnement, le surendettement, le mal-investissement ne sont pas étrangers aux profondes crises agricoles actuelles et à l'assujettissement progressif des fermes aux logiques industrielles. L'offre technologique et matérielle disponible pour les agriculteurs s'oriente toujours plus vers l'automatisation par le numérique (big data) et la robotique, des technologies censées être mieux placées que l'agriculteur pour diagnostiquer et intervenir aux champs (Programme « Agriculture et Innovations 2025 » en France). Ces constats ne sont pas suffisamment documentés et ne font l'objet d'aucune étude scientifique globale et d'aucun examen critique sérieux. Largement financés par l'État au travers d'aides directes et de dispositifs fiscaux, les investissements des agriculteurs sont soutenus sans vérification de viabilité économique, écologique et sociale, ou selon des critères peu ambitieux. Dans le même temps, le déploiement des nouvelles technologies ne souffre lui non plus d'aucun examen sur sa pertinence autre que pour le secteur industriel porteur de ces « innovations », de sa viabilité écologique quant à l'utilisation de ressources non renouvelables, de sa dimension éthique quant à la confiscation des savoirs et savoir-faire des agriculteurs au profit de l'intelligence artificielle. Le réseau InPACT national est pionnier dans l'émergence d'un débat public autour des agroéquipements, champ de réflexion qui était jusqu'à présent un impensé politique et scientifique. Ces thématiques nourrissent notamment le groupe InPACT « *Evaluer autrement les politiques publiques agricoles* ».

Le réseau InPACT national est composé de 10 structures nationales qui fait vivre au quotidien la possibilité d'une Agroécologie Paysanne : la FADEAR, le Réseau CIVAM, Terres de Lien, Solidarité Paysans, Accueil Paysan, le MIRAMAP, Nature et Progrès, le MRJC, l'interAFOcG et L'Atelier Paysan.

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An innovative approach to enhance biodiversity on farmland: A credit point system

STÖCKLI Sibylle

The credit point system is based on 32 measures known to enhance farmland biodiversity and has proven to be a suitable and efficient indicator for farm-scale biodiversity, which makes it applicable in large scale agri-environment schemes.

Agricultural subsidies are an efficient tool to influence agricultural practices with the aim to improve biodiversity. The current agri-environmental schemes have only resulted in small effects on farmland biodiversity. Successful implementation of adaptive measures often fails because farmers are overwhelmed by the ecological complexity and administrative burdens. Furthermore, ecological compensation payments (state subsidies) do not seem to be attractive enough to be competitive with intensive farming. This project aims at developing management options for a "wildlife-friendly" agriculture and at validating the effect of the suggested options on biodiversity at farm scale. Farmland biodiversity has often been assessed, but seldom at the farm scale, although it is ultimately the farm level at which decisions are taken. Furthermore, an intensification of the advisory support should help farmers improve their impact on biodiversity.

A credit point system (CPS) was developed to assess farmers' contribution to biodiversity. We evaluated how well the credit point scores correlate with the measured farm-wide biodiversity on 133 farms of the Swiss lowland plateau. The CPS consists of 32 measures known to enhance farmland biodiversity. Farmers can score points by applying these measures on their farms. They can choose between the measures and therefore adapt the set of measures based on the farm-typ and management. The majority of them are measures from the Swiss agri-environment scheme, so called ecological compensation areas (i.e. extensively managed meadows, hedges, wildflower strips). The quality and size of the areas is also recorded. Further, application of arable and grassland in-field options (i.e. no herbicide, staggered moving) as well as for the conservation of genetic diversity yield points. The point assignment accounts for farm size. The scores are weighted according to their known benefit for biodiversity. It was verified whether the resulting CPS score and farm-scale biodiversity are correlated considering plants, grasshoppers, butterflies and birds. The CPS score was found to be the most suitable predictor for a fast and efficient assessment of farm-scale biodiversity, which makes it suitable for use in large scale agri-environment schemes. Our results provide evidence that farmers can indeed positively influence biodiversity by ecological compensation and in-field options. Specifically we highlight the value of new biodiversity-relaated management practices such as in-field options. We found that the effects of biodiversity-related farming practices differ between species and biodiversity metrics. The CPS allows for a self-evaluation and farmers can directly see how their decisions affect their CPS score. It has been demonstrated that the CPS in combination with a farm-tailored advisory service increased the area of suitable, high-quality and site adapted agri-environment areas compared to non-advised farmers. In the meantime the CPS or adapted versions have been successfully implemented in the agricultural practice.

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Urban community gardens to achieve social justice

TUSCANO Martina

The subject of social justice in agro-food systems requires a symmetrical approach to analyze the different issues of the citizen and institutional levels.

Les Aubiers is a popular district in Bordeaux created in late '70. Since it was built, it was known for being a poor district with a high rate of unemployment and social discrimination resulting from the foreigner status of the majority of the inhabitants. In 1993 family gardens were created thanks to a citizen association in cooperation with the municipality of Bordeaux. Today there is a totality of 70 plots.

A lot of gardeners and their family started to use those sharing spaces and create links with other inhabitants of the district, or at least increasing contact and dialogue with them. Thanks to the gardens, a lot of gardeners started to *produce something*; sometimes they sold their vegetables for money or just as a gift to a neighbour or to a family member. This can be considered a way of increasing social equity, as long as un employment and isolation lead to a loss of individual capacity to satisfy individual and family needs.

On the other hand, the structure of this initiative leads to a reproduction of the devaluation of an already vulnerable population. Family gardens, unlike the shared gardens, are in fact affiliated by social criteria. The discourse and practice of political institutions and associative actors thus passes through the historically constructed image of "feeding the poor" or "teaching the poor to eat well". Consequentially, we can observe a reinforcement of the social stigmatization of the "poor" which prevents a real debate around the concept of social justice and still less an affirmation of the latter.

Questioning the issue of social justice in the agri-food initiatives in urban areas makes it possible to advance the scope of individuals for the rehabilitation of their social position. Also, it helps to reveal the reproductive mechanisms of some forms of marginalization. However, for a critical and proactive approach to the issue it is necessary to analyze symmetrically discourse and practice of all subjects to understand the complexity of the issues of the citizens and institutional levels.

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Farmers ecological knowledge to support agro-ecology development in Provence

VADON Anne, CAMPAGNE Jean-Luc, BARRET Philippe

Since 2012, six natural regional parks[1] of Provence-Alpes-Côte d'Azur region and the NGO GEYSER are collecting the ecological knowledge of local farmers and experimenting how it can be helpful to develop agro-ecology.

They are convinced that it is very important to rely on farmers experience and to mobilize their capacity of observation and innovation as well as the legacy they received from their elders. Far from the idea of providing good recipes, they propose, through a book published in March 2017[2], to be inspired by this kind of local and empirical knowledge to invent an alternative to the current model.
The book includes 8 main chapters which are a contribution to building up a new framework for agro-ecology. For example, the first chapter deals with activating soil life and not only with tillage; another one is about saving and sharing water and not only about irrigating. Looking for a holistic vision, the book includes as well the life story of 9 farmers.
This work is not only about publishing a book. The regional parks are currently using this knowledge in the implementation of several projects, as testing old cereals, protecting mountain hay meadows, promoting small diversified orchards or environmental-friendly ways of growing rice.

1. The natural regional parks are created by local and regional authorities, under supervision of the French Ministry of environment.
2. Vers l'agro-écologie - Paroles de paysans, ouvrage collectif, 200 p., www.actes-sud.fr

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‘Hidden treasures’: agro-ecological practices in Europe

VAN DER PLOEG Jan Douwe

In my contribution I will argue that agro-ecology is not to be built from scratch. Instead, throughout Europe convincing and highly interesting agro-ecological practices can be discerned. These are mostly known as ‘low external input agriculture’, ‘pure grazing’, ‘closed cycle agriculture’, ‘farming economically’, or whatever - but they show, essentially, all the strategic features of what is currently identified as agro-ecology. Such practices are often grounded in peasant-like ways of farming, but they may equally stem from the more recent search for a sustainable agriculture. The empirical analysis of such agro-ecological practices shows that they not only excel in sustainability, but also render very good socio-economic results. Hence, these often neglected realities are ‘hidden treasures’ and it is paramount that ‘Agroecology Europe’ builds as much as possible on them – connecting them, exploring them, representing them theoretically and making the inbuilt rationale to ‘travel’ to other places. For doing so, agro-ecology as a science is to be grounded firmly in both peasant knowledge and in a thorough exploration of the heterogeneity of fields, farms, practices, productive outcomes, etc. As various recent experiences in Europe demonstrate, a close co-operation of involved scientists and agro-ecological farmers might successfully impact upon policies.

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Toward agroecology territory: the challenge of enrolling multiple stakeholders in Participatory Action Research (P.A.R.)

VANDENBROUCKE Perrine, BRIVES Hélène, CASAGRANDE Marion, CLÉMENT Camille, HEINISCH Claire, PEIGNÉ Joséphine, VIAN Jean-François

There is a need to pass through narrow entrance doors to enrol stakeholders in P.A.R. for agroecology transition. The broad and systemic approach toward agroecology territories gives a direction and can broaden perspectives at second stage.

Agro-ecological transition should be (1) a collective process throughout the food system which includes social, economic and political structures at a local scale (Gliessman, 2011), and (2) it should be lead through participatory and interdisciplinary researches (Mendez and al., 2013; Stassart et al., 2012). This contribution questions the implementation of those methodological and theoretical principles through the analysis of a Participatory Action Research project whose main goal was to engage and study transitions towards agroecology territories (Wezel and al, 2015). It focuses on the way the multiple stakeholders and researchers got involved in the P.A.R. process, at its different stages. According to those principles, agroecological transition should enrol multiple stakeholders throughout a given territory: those directly involved in the food system – farmers, retailers, distributors, consumers – but also local development actors including elected officials, local civil servants, agricultural advisors and environmentalists; and it should involve researchers from different disciplines such as geography, agronomy, sociology for instance. We show out that at first stage, many different stakeholders and researchers felt interested by a broad approach on agroecological transition, referring to a "citizen based" attitude. But, the commitment in action-research projects for agroecological transition required to focus on specific issues in order to enrol researchers and stakeholders in their fields of expertise and action. Nevertheless, keeping a broad orientation on agroecological transition contributes to enrich each experimentation, to drive stakeholders and researchers to the borders of their expertise, to enhance crossed-knowledges. It can thus contribute to the emergence of new research and innovation fields for action. This contribution thus shows that a systemic and global approach on agroecological transition can give a direction. It is not operational for direct implementation of transition at food system scale. Action pass first through specific issues such as transitions at cropping systems scale for example. Nevertheless, in the long term of this project, pluridisciplinary and multi-territorial relationships contribute to change postures and cognitive frame of the different stakeholders and thus participate to the emergence of innovation fields.

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Agroforestry practices as tools for sustainable agriculture: a case study from Ethiopia

WOLLE Hailie Shiferaw, BARBERI Paolo

Ethiopian agricultural lands are fragile due to inherent soil properties, over-exploitation, mismanagement (deforestation, over-grazing and inappropriate land use systems) and weather conditions. These factors, even worsened by changing climatic conditions, lead to significant problems in terms of soil erosion and loss of soil fertility. The consequences of such processes can be detected on the economic level (agricultural production - which accounts for 48% of the country GDP – is currently being jeopardized), on the social level (with risks of food insecurity and increasing malnutrition rates) and on the biological one (i.e. risks of biodiversity loss and habitat fragmentation). Agroforestry practices can help in mitigating the negative impacts of the above mentioned processes. This project has been carried out in Amhara regional state, Ethiopia. For this study five villages with home-garden and parkland agroforestry systems were selected. Within each village, 15 households were selected and categorized according to the sex of the managing person. Vegetation surveys were carried out on both home-garden agroforestry systems (10x10 m sampling plot per household) and parkland agroforestry systems (two transects 1000 m far from one another, with 50x100 m plots laid at 300 m distance along the transect). Gender significantly affected the choice of livelihood strategy. Women opted for a broader range of strategies than men. The more diversified set of options for women is mainly due to the fact that they are often able to play an autonomous role in livelihood diversification than men. A total of 148 plant species (60 woody and 88 herbaceous), belonging to 51 families were recorded in the homegarden agroforestry whereas in parkland agroforestry system a total of 24 plant species, belonging to 15 families were recorded. Higher species diversity found in the homegarden agroforestry system and it acts as a place of protection for treated species like *Cordia africana* in Ethiopia.

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Interaction between biochars and arbuscular mycorrhizal fungus (AMF) on the growth of potato

YANG Qi

The application of biochar WSP 550 (wheat straw pellets pyrolyzed at 550 ℃) at 1.5 % when inoculated with AMF resulted in the highest biomass weight of potato.

Methods

Pot experiment was conducted in semi-field, Foulum, Aarhus University, Denmark. Four types of biochars, which were pyrolyzed from wheat straw pellets (WSP) and miscanthus straw pellets (MSP) at 550 °C and 700 °C respectively, were used. The inoculum contains 1 million spores of beneficial symbiotic AMF per 250g of carrier. A randomized experiment with three replicates was designed as a three-factorial experiment including (1) biochar type, (2) biochar application rate (0, 1.5 % and 2.5 %, in dry weight), and (3) AM inoculation (AM+, AM-). This resulted in 18 treatments.

Conclusions

Biochars pyrolyzed at 700 °C decreased the biomass weight of potato regardless of the presence of AMF. The application of WSP 550 at 1.5 % when inoculated with AMF resulted in the highest biomass weight of potato.

The biochar application rate and type had significant influence on AMF root colonization rate. The AMF root inoculation rate of potato plants increased with the increasing biochar application rate of all four types of biochar.

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Crop diversity and rotation may increase reptile biodiversity in an agroecosystem

ZIV Yaron

As crop rotation between wheat and legume fields is common worldwide, our findings highlight the importance of creating an agricultural mosaic to enhance biodiversity permeability within the agricultural matrix.

Agroecological landscapes should provide opportunities for organisms to move between natural areas and different crops in order to reduce extinction probability and negative effects of small isolated populations. We tested whether legume fields differed from wheat fields in their effects on reptiles' movement patterns. We conducted our study in an agroecosystem consisting of small isolated natural habitat patches nested within agricultural fields. We trapped reptiles in sampling arrays before and after harvest in both wheat and legume fields, and in adjacent natural habitat patches. For both crops, prior to harvest, we found an increase in movements of *Trachylepis vittata*, the most common reptile in our study, from the natural habitat patches into fields, but negligible movement in the opposite direction. In both crops before harvest, the individuals that moved into the fields were adults of better body condition than those remaining in the natural habitat patches, suggesting that long-distance movements were only possible for individuals with high prospective fitness. After harvest, no movements were documented between wheat fields and natural habitat patches. However, in legume fields, a high symmetrical movement (i.e. in both directions) of individuals of similar body condition between fields and natural habitat patches took place. Importantly, newborn lizards were only found in the natural habitat patches and in post-harvest legume fields. Our results suggest that agricultural heterogeneity, through a mixture of crop types may mitigate some of the negative effects of particular crops on biodiversity. As crop rotation between wheat and legume fields is common worldwide, our findings highlight the importance of creating an agricultural mosaic to enhance biodiversity permeability within the agricultural matrix.

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