LANDSCAPE
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MULTIFUNCTIONAL FARMING

An international interdisciplinary conference on:

Multifunctional Farming: Landscape, People, Food, and Ecology

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Background and context

Farming land use extends onto 50% of the EU's land area, making agriculture a significant part of human activity that impacts environmental quality and the bio-cultural diversity of landscapes. It is an integral part of the cultural identity shaped by generations of rural communities. Therefore, the integration of farming practices with the environmental characteristics of particular landscapes, coupled with the autonomy of locally embedded communities, constitutes an important foundation for human culture at local, regional, and broader scales. From an ecological perspective, the durability of agricultural land use secures the long-lasting, characteristic pattern of (zoo-)anthropogenic disturbances, shaping the structure and ecological processes of landscapes while fostering biodiversity. A particularly important role is played by many-generation, smallholder farmsteads engaged in multifunctional agriculture, preserving a very diverse, "fine-grain" structure of cultural landscapes - an irreplaceable biodiversity "condensifier" and "sustainer".

Global mechanisms favouring industrial agrobusiness have precipitated the disappearance of self-sufficient, multifunctional farms in numerous regions worldwide. In Poland, where such family farms were the nation's primary food supplier three decades ago, there is still an ongoing and noticeable decline. Along with agricultural abandonment, we are witnessing very profound changes in rural landscapes. Some areas, subjected to field aggregation, transition into homogenous industrial monocultures, while others are sacrificed to the fight against climate change and transformed into photo-voltaic or wind farms, vast fields for biomass or biofuel crops, and yet others are invaded by developmental sprawl. Although some of the abandoned farmlands undergo spontaneous ecological succession, it is anticipated that over many decades they will more likely evolve into shrubby feral wastelands rather than fulfilling the idealised vision of a "wilderness".

In any case, the abandonment of smallholder, multifunctional farms leads to the loss (often irreversible) of the biological richness of the landscapes and the cultural values embedded in local communities. This phenomenon undermines food sovereignty and security - a trend taking place in the whole world. Nevertheless, most agricultural economists claim that such smaller farms ought to vanish, with only large, industrial farms deemed capable of ensuring substantial income for their owners and meeting the world's food demands.

Despite the key significance of agriculture for multiple aspects of human life and the environment, solutions to major environmental and ecological challenges are often sought outside the realm of agriculture, or, more commonly, positioned against it, considering it as a major culprit. This tendency stems from a lack of recognition of the positive role of husbandry in provisioning and sustaining landscapes rich in biodiversity.

Agriculture requires a holistic approach, taking into account its crucial functions across various dimensions, including the natural, socio-cultural, and economic realms. Therefore, the primary objective of the conference is to facilitate the exchange of knowledge and experiences, as well as to foster connections and cooperation between those cultivating and using the resources of agricultural landscapes. The conference aims to bridge the gap between scientific research and practice.

Andrzej Bobiec

Abstracts

Innocent abroad: an outsider's tour of multi-functional grazing farms across Europe

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Keywords: Conservation, Grazing, Grassland, Wildlife, Livelihood, Producers

Abstract: Grasslands and grassland wildlife co-evolved with and depend upon European grazing cultures. Now all are being lost to one of two extremes: land-use intensification or abandonment. Both generally lead to biological simplification due to the elimination of habitat niches. As more and more traditionally managed grassland is lost, it is being recognized that maintenance of extensive herbaceous environments is inextricably linked to grazing. In fact, after being criticized for many years, grazing has been acknowledged as an ecological process, with grazing animals becoming viewed as potentially positive "ecosystem engineers". The result is the emergence of the concept of conservation grazing, effectively a multifunctional combination of production and conservation. Yet substantial questions remain about what "conservation grazing" is, what practices constitute it, what the underlying ecological principles are, how it should be managed and by whom, and what economic and policy conditions support or inhibit adoption. To address these questions the author (a U.S. citizen) undertook a seven-month research tour through Portugal, Hungary, Romania, the United Kingdom, France, and Albania. More than thirty on-farm interviews and farm walks were conducted. Results of these semi-structured interviews suggest that habitat and wildlife outcomes of grazing can result from active or passive management for conservation, effective practices follow describable ecological principles (some that contrast with standard grazing management recommendations), positive outcomes are dependent upon earnest and collegial relationships between conservation workers and farmers, policy and market mechanisms have mixed effects on adoption but positive intervention/incentivization is generally critical, and regulatory mechanisms often fail to deploy collaborative and flexible management approaches. This presentation reports on tools and practices for management, the alignment of conservation grazing practices with ecological principles, the outlook and perspectives of producers, and how conservation practice adoption appears to be aided or inhibited.

Stephen Bramwell is a County Director and Regional Agriculture Specialist for Washington State University Extension. He earned an MS in Soil Science from Washington State University and a BA in International Community Development at the University of Washington Jackson School of International Studies. His areas of research and extension include use of conservation grazing for rare species and habitat protection in semi-natural grasslands; soil health management practices for grasslands, pastures, row crop production, and gardening; market development and farmer cooperatives for local agriculture and food access, including farm-to-school initiatives; specialty grain production, new farmer training, and agriculture workforce development.

Rural landscape and agricultural policy in Europe

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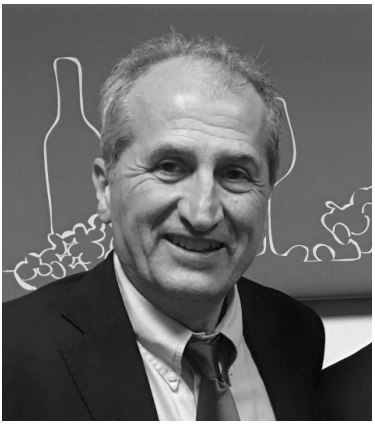
Keywords: Agricultural abandonment, Agricultural intensification, Biocultural landscapes, EU Common Agricultural Policy, National Register of Historic Rural Landscapes

Abstract: The EU Common Agricultural Policy (CAP) was formally established with the Treaty of Rome, which created the European Economic Community (EEC), the precursor to the EU. One of the founding goals of the EEC was to establish a common market for agriculture, mainly aiming to increase food production. The result of this policy was to promote agricultural intensification and higher production only in a limited part of Europe, favoring the abandonment of many rural areas not suited for intensive production and the degradation of many traditional rural landscapes. With the McSharry reform in 1992, and the introduction of the concept of multifunctionality there has been a change from traditional economic incentives to production, to a support oriented also to nonmarket values of agriculture, and a new emphasis was placed on environmentally sound farming and to respond to the public's changing priorities. However, in practical terms, this new policy was mostly directly to protect or restore nature and natural habitats, or to introduce natural elements in the countryside with very little attention to the conservation and valorization of rural landscape, despite the fact that landscape was actually indicated as one of the objectives of CAP. Europe is a continent with a very high correlation between genetic diversity and landscape diversity and the European rural territory, according to the Convention of Biological Diversity and UNESCO is mainly a biocultural landscapes, where biodiversity is linked to human action. Failure to address the conservation of the biocultural features of the European landscape may negatively affect the cohesion strategy and the integration of so many different cultures in one common project. In the framework of rural development strategy, landscape can be considered and added value that cannot be replicated by a competitor, especially when linked to high quality food and tourism. In Italy a National Register of Historic Rural Landscapes was established at the Ministry of Agriculture in the framework of the National Strategic Plan for Rural Development. In the current CAP 800 million euros of subsides are offered to famers included in these areas. A National Association of Historical Rural Landscapes was also created gathering the representative of the sites officially designated in the Register.



Mauro Agnoletti, Professor, UNESCO Chair - Agricultural Heritage Landscapes Dept. of Agricultural, Food, Environmental and Forestry Sciences and Technologies, University of Florence; President of the National Association of Historical Rural Landscape (Italy).

He has been teaching courses on the planning of rural landscape and environmental history in Italy, the USA, Germany, France, and Poland. In 2007, he served as the coordinator of the Guidelines for Social and Cultural Values in SFM for the Inter-Ministerial Conference on the Protection of Forests in Europe (MCPFE). He is the author of the country case "Italy", dedicated to landscape and forests, in the State of the Forest of the World 2018. He is the Coordinator of the National Register of Historical Rural Landscape, Ministry of Agriculture and Forestry, Italy, and the president of the Landscape Observatory of the Regional Government of Tuscany. The co-editor in chief of the journal "Global Environment", White Horse Press (UK), and the editor in chief of the series on Environmental History by Springer Verlag. His book on Italian Historical Rural Landscape (2013) has been in the top 25% of the best-selling books by Springer. More: www.mauroagnoletti.com

Survey and conservation of fruit landraces in the Bükk National Park, Hungary

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Keywords: Old fruit varieties, Landraces, Genetic conservation, Extensive orchards, Ecosystem services

Abstract: The presentation will briefly introduce the background of traditional fruit cultivation at the foothills of the Bükk Mountains in terms of climate, biogeography and cultural history of the area. A brief historical overview of fruit cultivation in Hungary is given, aiming to identify a few of the most significant influences from the Middle Ages to modern days. Traditional orchards are discussed as habitat types hosting high values of biodiversity and ecosystem services.

Some notable occurrences of traditional orchards in the Bükk Mountains have been subjected to pomological surveys during the last 20 years, the most interesting results of which are presented. Results of recent activities are introduced such as the series of grafting workshops in March 2025 as well as the associated questionnaire survey of old fruit trees and their ecosystem services in private gardens. Lastly, future plans of the Bükk National Park Directorate for conducting further pomological surveys, restoration of traditional orchards and the establishment of a local gene bank is introduced.

Ildikó Arany, PhD, has a background in biology and her early career experiences included vegetation ecology and biodiversity policy at national and EU level. She earned a PhD in the Hungarian University of Agriculture and Life Sciences in the topic of assessing honey provisioning capacity as an ecosystem service. She has participated in a couple of research projects focusing on ecosystem services, where she has applied participatory methods, working with stakeholders. Currently she works for the Bükk National Park Directorate, being responsible for, among other topics, the conservation of traditional ochards and local fruit landraces. She is an amateur farmer and beekeeper herself.

Challenges of corncrake (*Crex crex*) conservation in a Transylvanian cultural landscape

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Keywords: Corncrake, Species conservation, Agri-environmental schemes, Cultural landscapes

Abstract: The efficacy of species-oriented agri-environmental schemes has been a subject of considerable debate. Some attribute the failure of the measures to low uptake and small coverage areas, while others express concerns regarding the concept in its entirety. To see this complex ecological and socioeconomic problem more clearly, we need to take a closer look at local case studies.

Our research focused on the conservation of the corncrake (*Crex crex*) within a Transylvanian cultural landscape. Semi-structured interviews were conducted to address the following questions: (1) What is the local ecological knowledge about the corncrake, and how do local farmers perceive this bird? (2) How do local farmers see the rules imposed by the agri-environmental scheme targeting corncrake conservation? (3) Since applying for the subsidies is not mandatory, what are the actual reasons for and against joining the corncrake program? Our findings indicate that this emblematic conservation species did not hold the same significance for local communities. Local farmers rarely encountered the species and were mostly unacquainted with its call. The species' recognition was primarily attributed to financial incentives in the form of subsidies. Farmers mostly joined the scheme when it did not necessitate significant alterations to their farming practices.

We discuss the ramifications of this phenomenon and the challenges of conserving a species that is "invisible" to the local community. We also outline opportunities for knowledge co-production and adaptive management to overcome the shortcomings of the current conservation measures.

Réka Szilágyi, PhD Student at ELTE Eötvös Loránd University, Doctoral School of Biology, Budapest, Hungary, working with the Traditional Ecological Knowledge Research Group at HUN-REN Centre for Ecological Research, Vacrátót, Hungary. Her research explores the relationship between species conservation and local ecological knowledge, with a current focus on corncrake conservation in a Transylvanian cultural landscape. She is particularly interested in the ecological knowledge that local farmers have about this highly emblematic bird and how they perceive the efforts to protect it, as well as how conservation specialists view the same conservation initiatives. She enjoys the challenge of understanding different knowledge systems, mediating between conflicting worldviews and fostering knowledge co-production. Fascinated by landscape history, traditional land management, cultural history, the interplay between tradition and modernity, human-nature relationships and the emerging challenges of nature conservation.

The politics of change – cultural severance & the loss of Commons

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Keywords: Cultural severance, Environmental change, Countryside politics, Eco-cultural heritage, Rewilding

Abstract: In the twenty-first century, global ecological systems face unprecedented anthropogenic challenges, with environmental changes driven by human exploitation and degradation. Indeed, the failure of nature conservation to effectively address the impacts of burgeoning human populations and associated resource exploitation, has led to a growing movement advocating 'rewilding' that gathered momentum during the early years of the new century. I have long advocated 'wilder' landscapes and countryside but questioned the underlying science and understanding of history relating to 're'-wilding. My reason for this concern about the concept of rewilding is firstly, the arbitrary separation of people and nature, i.e., humanity apart from nature rather than a part of nature. Implicit in this are the politics of nature conservation and the idea of nature (without people) being 'free-willed', and people abdicating responsibility for their past (and present) impacts. Essentially, we have damaged and altered the planetary systems, but now release nature to somehow heal itself, and there is the assumption of a return to a 'golden age'. Like most such concepts, the latter is largely a myth. Secondly, particularly apparent in regions such as Europe and Britain, much biodiversity is associated with cultural landscapes, and we are often dealing with biocultural diversity and eco-cultural heritage. Over long timelines, human communities living in the landscape have utilised resources and changed conditions to forge the countryside we see today. Until the critical advent of widespread petrochemical energy use and the impacts of capital-based, market-driven agriculture and forestry, this exploitation was largely sustainable and subsistence-based over centuries. Over-exploitation caused degradation but, in many cases, communities adapted their farming and forest use to particular environmental conditions and locally- or regionally-distinctive landscapes emerged along with associated biodiversity. This eco-cultural biodiversity might have wildness about it, but it was not and is not wild.

However, with the coming of the agricultural and industrial revolutions from the 1700s onwards, a political process I describe as 'cultural severance' increasing separated people from nature at a local subsistence level. Local ownership, management, dependence, and governance were more and more replaced by capital-based, petrochemically-subsided systems and rapid environmental degradation. The traditional or customary usage certainly changed landscapes and ecology, but over many centuries. Without the gross disruption and eutrophication of modern capital-based systems, many species adapted, survived, and in many cases, thrived. Indeed, local and regional dependence inherently engendered sustainable practices because local community survival depended on them. With capital-based systems, survival is several steps removed.

Rewilding is frequently a reaction and response to rapid, capital-based degradation and disruption of ecology, and the principles of 'wilding' have much to offer. However,

a lack of understanding of ecological science, of our human history and heritage, and of the politics of the countryside, may be counter-productive and inadvertently cause further loss of biodiversity and disruption to traditional human communities at a landscape scale.

Indicative references

Agnoletti, M. (ed.) (2006) The Conservation of Cultural Landscapes. CABI, Wallingford, Oxfordshire.

Agnoletti, M. & Rotherham, I.D. (2015) Landscape and biocultural diversity. Biodiversity & Conservation, 24, 3155-3165.

Bobiec, A., Rotherham, I.D., Kırca, S., Molnár, Z., & Agnoletti, M. (2024) Towards biocultural realism: Connecting conservation with historical ecology and common sense. A European perspective. Ambio, https://doi.org/10.1007/s13280-024-02089-2

Bridgewater, P., & Rotherham, I.D. (2019) Biocultural diversity and its role in nature conservation and heritage. People and Nature, 2019, 00: 1-14.

Rotherham, I.D. (2010) Cultural Severance and the End of Tradition. Landscape Archaeology and Ecology, 8 (2), 178-199.

Rotherham, I.D. (2011) The implications of cultural severance in managing vegetation for conservation. Aspects of Applied Biology, 108, 95-104.

Rotherham, I.D. (ed.) (2013) Cultural Severance and the Environment: The Ending of Traditional and Customary Practice on Commons and Landscapes Managed in Common. Springer, Dordrecht.

Rotherham, I.D. (2014) Eco-History: A Short History of Conservation and Biodiversity. The White Horse Press, Cambridge.

Rotherham, I.D. (2015) Bio-Cultural Heritage & Biodiversity - emerging paradigms in conservation and planning. Biodiversity & Conservation, 24, 3405-3429.

Rotherham, I.D. (2018) The implications of ecological fusion and cultural severance for re-wilding. Aspects of Applied Ecology, 139, 91-101.

Ian D Rotherham, Emeritus Professor, Advanced Wellbeing Research Centre, Sheffield Hallam University, is an expert on a range of environmental issues, including urban wildlife, extreme weather, flooding and climate change. He has published extensively in academic journals, and has released a number of books on UK wildlife and the environment. He writes regular columns for local and regional newspapers and has a weekly phone-in on BBC Radio Sheffield and has advised and appeared for national news and documentaries.

Through the eyes of a Skylark: birds as biocultural indicators of agricultural landscape change

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Keywords: Biocultural indicators, Environmental trends, Farmland birds, Rural landscapes

Abstract: Birds are not just elements of biodiversity — they are eloquent narrators of landscape history. Their presence (or absence) in agricultural areas tells a nuanced story about ecological, cultural, and economic transformations, especially over the past few decades. Species like the skylark, lapwing, or white stork are not merely biological entities, but cultural symbols that bridge traditional knowledge and ecological science.

In this talk, I will explore birds as biocultural indicators, organisms that both reflect and shape the evolving relationship between people and the land. I will discuss how the decline of traditional, mosaic landscapes — replaced by monocultures and technological intensification — affects bird populations, and what this means for local communities and their identity. I will highlight two temporal lenses through which these changes can be viewed: the long evolutionary perspective, in which birds are shaped by deep adaptation to cultural landscapes; and the shorter ecological timescale, which reveals their rapid responses to contemporary environmental shifts.

Special attention will be given to the role of pastoralism and traditional farming as practices that foster coexistence between agriculture and nature — and in which birds have historically thrived.

Is there a future in which birds once again become a vital part of rural landscapes — not only as targets of conservation, but as full participants in a shared cultural and ecological heritage? This is not just a question of biodiversity, but of the values we choose to carry forward into the future.

Piotr Tryjanowski, Professor, Poznań University of Life Sciences & Institute of Advanced Sciences TUM Munich, self-educated ornithologist, he studied agricultural ecology, mathematical modelling, and ecology (with population ecology). His work commonly deals with agricultural areas, and more recently with urban environment. He was an expert for Intergovernmental Panel on Climate Change (IPCC) and published papers with international teams in top scientific journals such as Nature, Nature Communications, Global Ecology and Biogeography. Fascinated by independency and conservation, so he launched a project "data not dogma," looking for evidence for effective nature conservation. This has been a reason for cooperation with farmers, hunters, engineers, urban planners etc. Being very keen on interdisciplinary approach, he undertakes public and educational activities, referring to various scientific disciplines, including, besides biology, sociology, psychology and economics. His work is well is highly cited by scientific papers, textbooks, as well as covered by media.

Reading European landscapes in retrospective

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Keywords: Landscape change, Landscape classification, Visual assessment of landscape processes

In 1995 the European Environment Agency examined the quality of air, water, land and biodiversity in the continent. Thirty major types of landscapes are discerned, based on their general characteristics of climate, soil, landform, crop and composition (open fields versus enclosed bocages). Farming and forestry shape the landscape significantly: 42% of the total land area serves some agricultural purpose, while more than 33% is covered by forests, orchards, and hedges. Central European landscapes are mixed landscapes, where the system is based on a symbiosis of forestry, cropping and animal husbandry. Polders and deltas are among the most densely populated and intensively used areas of Europe. They are created by reclamation the lowlands by a network of canals and dykes. The variety in Europe is tremendous. Age-old and young cultivations, rural and urban settlements, all of them consisting of several subcategories. There is a widespread tendency towards de-mixing, in- and extensification of agriculture and uniformization of the landscape. A conclusive definition of landscape quality covering all of Europe is out of the question. Therefore, the culture is too different and the history too miscellaneous. Landscapes are in a permanent process of transformation. Terraces, orchards and canals collapse if they are not maintained. Agriculture, forestry, tourism and urbanization can make the landscape but also literally

break it down to the ground. The question is how to blend the new into the old, to form identifiable compositions over time.

Johan Meeus, Dr. ir., is landscape architect by profession. In 1984 he took his Ph.D. at the Agricultural University in Wageningen. Analysing landscapes and research by design are the main topics. For J. Meeus drawing by hand is the best way to sketch the atmosphere of a town and a country. His objective is not to depict all the leaves on a tree, but rather to portray trees in specific surroundings. Several Dutch cities were given his advice on greening urban and rural landscapes. The European Environment Agency in Copenhagen published the first continental landscape typology of his hand in the book titled 'Europe's Environment; the Dobris assessment' (1995). The Council of Europe made use of this work to formulate the European Landscape Convention (2000). At the conference, J. Meeus will refer to the scenario of development of rural landscapes that he predicted 35 years ago in his seminal work "Agricultural landscapes in Europe and their transformation" (Meeus et al., 1990, Landscape and urban planning 18, 189-352).

Traditional ecological knowledge: a knowledge bank for the future?

Molnár Zs.

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Abstract: Traditional practices based on ethnoecological knowledge are fundamental to biodiversity stewardship and sustainable land use. Knowledge partnerships between Indigenous Peoples, traditional local communities, and ecologists can produce richer and fairer understandings of nature. Global institutions, like the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) or the Convention on Biologicl Diversity (CBD) have put traditional, indigenous and local knowlge into the frontline of discussions about sustainable futures, including a more fair and just conservation of nature. Ecologists and conservationists also increasingly acknowledge that traditional ecological knowledge (TEK) is vital for a better understanding and conservation of biodiversity, for example, for a more complex socioecological understanding of long-term processes, ecosystem resilience, the impacts of traditional management practices, and the worldviews underpinning these practices. To gain a deeper understanding of the ecological dimensions of TEK, ecologists and conservation biologists should conduct participatory long-term collaborative research on TEK. To conduct TEK research properly, however, ecologists need to familiarize themselves more deeply with the methodologies of social sciences, further develop their links with social scientists, and adopt new approaches, such as strengthening respect towards other knowledge systems and being inclusive in research and open to new types of validation. Biodiversity of European cultural landscapes is threatened by land abandonment and intensification. While the conservation benefits of traditional management practices have been long acknowledged, recognition of traditional knowledge started only recently in Europe. Respect for the holders of traditional knowledge (TK holders) themselves lags even more behind, often leading to social injustices. Social injustices towards TK holders span from disrespect and misrepresentation, invisibility, misunderstanding, economic and political vulnerability, unethical collaborations, rights violations, disconnection, uncontextualized education to lack of inclusivity – leading to neglect of TK holders in conservation science, policy and practice. Resolving these social injustices would benefit both people and nature. Benefits of resolving injustices include better cooperation in conservation management, mutual understanding, improved representation and participation, increased respect, economic and legal security, strengthened land stewardship, better tradition-based conservation innovations, and more appropriate management regulations.

Zsolt Molnár, Professor, Centre for Ecological Research, Hungary: Zsolt is a botanist and ethnoecologist, leader of the Traditional Ecological Knowledge Research Group at the Centre for Ecological Research in Hungary. He strives to understand how traditional herding and farming communities shape their landscapes, and manage their natural resources. He has special interest in ecological knowledge behind local land-use practices, ecological aspects of local worldviews, and local conceptualizations of nature and its elements. He has been exploring the role knowledge co-production with locals can play in improving nature conservation management. He works in Hungary, Romania, Serbia, Mongolia, Iran and Kenya. He is a member of the IPBES Indigenous and Local Knowledge Task Force and was a coordinating lead author of the IPBES Global Assessment.

Herder's and farmer's local values, adaptive use and traditional ecological knowledge of invasive alien plant species from Kiskunság (Hungary)

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Keywords: Traditional ecological knowledge, Adaptive management, Relational value, Tradition-based landuse, Invasive alien plant species

Abstract: The rapidly changing fine-scale cultural landscape of the Kiskunság region holds valuable protected natural and semi-natural habitats, with also changing, but once deeply embedded society shaping it over centuries. Tradition-based small-scale management by knowledgeable locals is essential for preserving both protected areas and local livelihoods, therefore socio-ecological approach, communication, and cooperation between local and scientific (nature conservation) knowledge systems are vital.

We aim to support these interactions by conducting interviews (a total of 54) both in-door (26 times) and out-door, participatory fieldwork (28 times) with locals (38 informants) documenting the fading traditional ecological knowledge in order to explore their perceptions and value categorizations of nature, with a special focus on adaptively evolving knowledge and local use of invasive alien plant species (25 IAS out of a total 200 local species), as one of the major drivers of regional landscape change.

We documented the local folk names and traditional uses of nearly 100 native and 20 invasive alien plant species, along with local names of their preferred habitats (ca. 50-60 types), and the adaptive changes of the traditional management practices. Climate change effects of the previous years increased the local use and value of invasive alien species, as they provide grazing forage for livestock during drought periods in summer months (e.g. Asclepias syriaca, Ambrosia artemisiifolia, Elaeagnus angustifolia).

We also found unconscious drivers behind the perception of invasive alien plant species. Such as locals automatically regard a species (e.g. Robinia pseudoacacia, Elaeagnus angustifolia) that has been part of the landscape since their childhood as native (cf. shifting baseline syndrome) and they find the presence of certain agressively spreading alien plant species (e.g. Opuntia spp., Gaillardia aristata) beautiful and joyful (relational value).

Through experiencing the differences in motivations and perspectives among the stakeholder groups, we understood the need for so-called bridging people who can mediate between the two knowledge systems to help reciprocal understanding in communication and cooperation.

Eszter Fodor, Nature Conservation BSc/ Human Ecology MA: My main area of interest, which defines both my personal and professional life, is human-nature relations. This holistic and relationship-based perspective itself requires a transdisciplinary approach. During my university years, I worked with a variety of associations, movements, and NGOs as an environmental educator. In this role I aimed to share ideas, knowledge, and experiences to young people, with the objective of fostering a deeper connection to nature.

A whole new and unique perspective opened up when I had the opportunity to join the Traditional Ecological Knowledge Research Group's decades of work engaging with local people who had been deeply embedded in the local landscape culturally, socially, and economically for generations, along with the natural environment their community had shaped over centuries.

Since January 2023, I could explore novel dimensions and drivers of relatedness as the focus of our research is local perceptions of invasive alien and rapidly spreading native plant species in the central lowlands of Hungary. We investigate the local ecological memory associated with these species and their traditional use alongside the continuously evolving adaptive management practices. As extensive livestock keeping and grazing have been identified as the most effecive conservational management practices for the grasslands and sandy forests of the area we aim to help and empower herders around the whole country in maintaining this traditional profession and preserving their knowledge of livestock and landscapes.

Agroforestry in Poland - where are we in its development compared to other European countries? Reflections of lobbyists after decades of its promotion

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Keywords: Agroforestry, Common Agricultural Policy, Forestry policy, Agriculture, Green deal

Abstract: Agroforestry is the collective name for systems and land use practices in which woody plants are intentionally integrated with crop or animal production in the same area. In Polish law, they refer to a variety of terms for tree planting, which remain at the interface between agricultural and forestry policy.

Despite being poorly established in law, agroforestry systems are considered by scientists to be the agricultural practice with the greatest potential for carbon accumulation in mineral soils. Thus, they also contribute significantly to increasing the organic matter content of farmland soils. Agroforestry systems protect the soil from erosion, improve biodiversity, field microclimate, nitrogen and phosphorus balance, limiting their leaching into water, and limit the spread of pathogens. They provide an excellent alternative for the management of marginal land, increasing land productivity and maintaining the vitality of rural areas. Examples of EU agroforestry farms show that this is an excellent way to diversify farmers' incomes, increase the added value of production and stimulate the tourism and recreational functions of the countryside. This applies to large farms as well as to smaller farms with fragmented land use.

Policy makers should focus on creating a favourable legal framework for agroforestry. This sustainable practice can become a valuable tool in Polish climate and biodiversity conservation strategies.

Trade-offs of animal production in Europe in view of 2050 - ecosystem services provision within planetary and nutritional boundaries

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Keywords: Livestock, Scenarios, Ecosystem services, Planetary boundaries, Food security

Abstract: Complex socio-ecological systems like the food system are characterised by large uncertainties concerning their future development, particularly towards long-term horizons such as 2050. Are we capable of feeding nearly 10 million people while the livestock sector is a key driver of humanity's transgression of three key planetary boundaries - climate change, biochemical flows and land system change, with ruminant meat production having a particular impact? To capture transformation dynamics of livestock systems in a realistic manner, we followed an iterative, stakeholder-driven approach, integrating visioning exercises, expert consultations, and structured analytical workshops to explore alternative, engaging, plausible and contrasting futures for the European livestock sector. This resulted in representations of potential future scenarios, each structured around a distinct logic or founding principle, allowing for a systematic assessment of trade-offs and synergies across environmental, economic, and social dimensions. In order to simulate different normative scenarios, we are using three quantitative models (economic-equilibrium model, life cycle assessment model and biophysical mass and nutrient-flow model). Participatory assessing the delivery of ecosystem benefits in EU from livestock is largely driven by outputs of Geo-SOL spatial model. Proceeding from spatial characterisation of livestock production systems of nine animal categories across Europe, it was possible to identify 39 different European livestock systems, connect them with the agreed normative scenarios and detail at regional level using supplementary knowledge. This allowed us developing participatory assessment of the trade-offs and synergies ultimately obtained through transition pathways for the European livestock sector. The work was carried out within the PATHWAYS project, funded by Horizon Europe and designed with the overarching goal of identifying policy options and business solutions to increase the overall sustainability of livestock in the European Union.

Robert Borek, PhD, is an agronomist and senior researcher at IUNG-PIB. Since several years he is focused on agroforestry (projects: Reforest, Agromix, Foodlevers, SustainFARM, AFINET), organic farming (Foodlevers), ecosystem services (ECOSERV-POL), livestock sustainability assessment (PATHWAYS), bioenergy crops (BioECON), low-carbon farming practices (national strategic project LCAgri) and adaptation of agriculture to climate change (strategic task for Ministry of Agriculture and Rural Development). He is member of European and Polish expert groups working on sustainable agriculture, agroforestry, bioeconomy and agro-environmental assessment of CAP Rural Development Program. He is founder of Polish Agroforestry Association and developing interdisciplinary country networks related to integrated food- and non-food production and organic production.

Ecological and economic evaluation of a complex alley cropping system ('syntropic agroforestry')

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Keywords: Complex agroforestry, Syntropic agriculture, Sustainability assessment, Ecosystem services assessment, Ecological-economic trade-offs, Decision support

Abstract: This presentation explores key findings from agroforestry research conducted within the DaVaSus project (Data- and value-based decision making for sustainable land-use) in Brandenburg, Germany. The project investigates regenerative and multifunctional management practices with the objective of evaluating their ecological and economic impacts using mainly digital monitoring methods. One of the focus management practices is syntropic agroforestry, an innovative and complex approach to agroforestry that mimics natural forest ecosystems, aiming to establish resilient systems that maintain long-term productivity without the need for external inputs such as synthetic fertilizers or irrigation. Syntropic agroforestry can be classified as a successional agroforestry system due to the integration of more than two stratification levels of trees and shrubs, the plant selection which is based on ecological succession, and the dynamic management approach. The investigated system is specialized in fruit and nut production with tree rows of 35 tree and shrub species, alternated with rows of forage crops (grass-alfalfa mixture). Ecological outcomes from field trials indicate significant differences in soil quality parameters - particularly in soil microbiome diversity, soil organic carbon (SOC) content, and soil moisture levels - when comparing areas under tree cover with adjacent crop rows. In addition to the ecological assessment, insights into the economic performance of the system will be given - particularly through analyses of work force requirements, yield estimates and profit margins - suggesting that the system's economic success highly depends on (direct) marketing options as well as availability and cost of skilled labour. All research results are integrated into an interactive, user-friendly decision support tool designed to facilitate the planning and implementation of complex agroforestry systems. The presentation will conclude with an introduction to the tool and a discussion of the visualized trade-offs between the ecological and economic implications and the ecosystem services provided by syntropic agroforestry.

Julia Toups is a researcher specializing in sustainable agricultural systems with an academic background in organic agriculture and agricultural economics. With practical experience in vegetable production and agroforestry, her work integrates ecological principles with economic frameworks to advance multifunctional and resilient farming systems.

She currently leads a research project at the Finck Foundation—an applied research platform and living lab for regenerative agriculture in eastern Germany. The project investigates the ecological and economic implications of multifunctional agriculture and the potential of digital technologies to enhance sustainability outcomes, aiming to evaluate the effectiveness of data-driven approaches in supporting climate and biodiversity goals. Julia's research interest focuses on the role of agriculture as a managed ecosystem, emphasizing the importance of maintaining ecological functions to ensure system resilience, with particular interest in multifunctional agricultural practices such as agroforestry and intercropping. A key area of interest is the internalization of externalities—both negative (e.g., greenhouse gas emissions, nutrient runoff, biodiversity loss) and positive (e.g., carbon sequestration, landscape preservation, water regulation) —through policy instruments, market incentives, and performance-based assessment methods.

Julia brings a strong interdisciplinary perspective and enjoys engaging in cross-cultural, dialogue to challenge assumptions and promote innovation in sustainable agriculture.

Forests of Drenthe, past, present, future. Interdisciplinary approach for revitalizing Dutch forests

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Keywords: Forest ecology, Historical ecology, Soil chemistry, Soil biology, Interdisciplinary research, Nature restoration, Forest regeneration.

Drenthe is a province in the Netherlands famous for its nature with over 37.000 hectares of forest. Only 3% contain old growth forests with a typical forest vegetation. This means that the biodiversity in these forests is vulnerable and under threat due to environmental changes. Due to problems such as nitrogen deposition, drainage, isolation and climate change the local government suspected a decline in the health status of the forests. To give insight in the health status, an interdisciplinary team combined landscape ecology, historical ecology, soil chemistry and soil microbiology in a broad gradient from old-young, dry-poor to wet- rich environments. Additionally, by using DNA technologies to identify bacteria and fungi, clear correlations were found between biodiversity in the soil and biodiversity above ground. For example, the amount of target-species (plants, flowers, herbs) was positively correlated to the microbial capacity of the forest to remove excess nitrogen via denitrification.

We discovered that old growth forests contain a higher biodiversity and a better soil quality than young forests. In the old growth forests, we have noticed that after the traditional agricultural land use disappeared (since 1900, 1950) the forests changed from a diverse mosaic into a monotone vegetation structure, also enhanced by negative environmental changes. Therefore we recommend policy makers and land owners that -apart from environmental improvements, ecological niches should be restored by reconnecting human-nature relations on different scales.

Combining all the data, practical measures were formulated to enhance forest health and bring back ecological niches. We will present how the different forest types look like, how they developed over time, what the current values are and how the treats could be solved on different places in the gradient. Perhaps farmers could play a role by restoring centuries old human-nature interactions.

Harm Smeenge, Dr. ir., is a landscape ecologist and lecturer at Van Hall Larenstein University of Applied Sciences. In 2020, he obtained his Ph.D. in historical landscape ecology from the University of Groningen. His research focused on the interdisciplinary analysis of landscapes, integrating methods and perspectives from the earth sciences, life sciences, and the humanities. The study resulted in a diachronic reconstruction of human–nature interactions in Northeast Twente (the Netherlands), spanning from the last Ice Age to the present day.

Harm Smeenge applies this interdisciplinary methodology in practice through his work with the Bosgroepen (Association for Sustainable Forest Management and Ecological Services), where he is involved in projects related to biodiversity enhancement, forest and nature restoration and climate adaptation.

At Van Hall Larenstein University, he is dedicated to educating students about the functioning of Dutch ecosystems and the ways in which these can be improved through ecological restoration and landscape-oriented interventions. Other related activities: member of the OBN-advisory board for nature management, nature policy and science, member of the Society for vegetation sociology, volunteer as a mudflat hiking guide at the UNESCO World Heritage site Waddensea.

Semi-natural grazing and sustainable use of „wild oaks": a brighter future of abandoned feral landscapes and rural communities?

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Keywords: Sandomierz Basin, Carpathian foothills, Agriculture abandonment, Feral post-agricultural landscapes, Developmental sprawl, Cultivated forest oaks, Wild extra-forest oaks, Oakscape, Ecological intensification, Livestock grazing

Abstract: Taking into account the ecological, natural, social, cultural and economic premises, we propose the transformation of post-agricultural rural areas into areas of extensive animal grazing, combined with the sustainable use of wild trees. The proposed model of optimizing the use of the potential of ecosystem services of landscapes and minimizing the degree of "investment" risk would mean a kind of return (taking into account and using the latest knowledge and available technological solutions) to the integrated, agro-silvo-pastoral land use.

The ecological intensification of abandoned post-agricultural rural areas through the introduction of a forest-pasture system, combining extensive grazing of animals with permanently sustainable growth and use of "wild trees" (mainly oaks) may turn the most resilient and beneficial way of landscapes and rural economy adaptation to the present ecological, economical, and social trends. We will present and discuss differences between the conventional silvicultural way of oaks growth, as practiced in the modern forest management, with the use of "wild oaks", naturally regenerated in the forest-pasture system.

The implementation of the proposed model of transformation and use of rural landscapes will require, first of all, the identification and removal of existing legal and administrative barriers that significantly hinder or even prevent the implementation of the concept on a larger scale. The continuous development and improvement of semi-natural grazing associated with the sustainable use of "wild oaks" will be possible through its interactive connection with "adaptive learning", based on a continuous process of studying the interactions occurring within the observed system, in response to the varying pressures of economic use.

In addition to the already advanced research on the effectiveness and ecological conditions of the natural regeneration of "wild oaks", a number of research areas and topics can be identified, the undertaking of which could significantly help optimising the forest-pasture system of post-agricultural landscape, as demonstrated during the field session.

The presented data and analyses have been collected and analysed within the study financed by the National Science Centre, DEC 2021/43/B/NZ9/01861.

Andrzej Bobiec, Professor, a forest and landscape ecologist, more than thirty years studying ecology and eco-history of forest habitats in Białowieża Forest, for the last dozen years, involved in research projects related to agricultural traditional landscapes, in particular to the non-forest "oakscape" ecology. More: https://www.ur.edu.pl/pl/pracownik/strony-pracownicze/andrzej-bobiec

Effect of acorn weight on germination and initial growth of the common oak seedlings

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Keywords: Field experiment, Forest, Non-forest habitats, Seedling germination, Survival

Abstract: The common oak *Quercus robur* L. is one of the most common deciduous tree species in Central Europe. As a heavy-seeded species, it owes its ability to colonise new areas to its symbiosis with the Eurasian jay. The starch-rich acorns provide seedlings with energy necessary to develop even under unfavourable environmental conditions. The aim of our experiment was to check the hypothesis of the effect of the acorn weight on survival and initial development of seedlings. For the experiment set in autumn 2022, we used viable seeds from two different oak trees. We planted 960 acorns were planted: 480 larger seeds from the oak in Krosno (K) and 480 smaller seeds from the oak in Mikołow (M). The acorns were planted in three different habitat categories: grassland, pioneering grove, and permanent forest. In addition, a control trial was set up under laboratory conditions with 30 acorns each of K and M. In the following year, we performed the scrutiny of all 960 sites, involving the germination (survival) rate and assessment of selected seedlings' biometric traits. Overall vitality, shoot growth mode and height, thickness at the root collar, number of leaves, length of the three longest leaves, and chlorophyll content were determined for each seedling. Based on the collected results, we established that larger K acorns secured a higher survival rate, especially in grassland. For the survival of smaller M acorns, pioneering birch-aspen-goat willow groves turned the most conducive. The environment least favourable for germination and early growth of both K and M acorns was permanent forest. The seedlings' leaves in the pioneering groves revealed a higher chlorophyll content to that in either grassland or permanent forest habitats.

The study was supported by National Science Centre, Poland, Grant UMO-2021/43/B/NZ9/01861.

Patrycja Kornafel, I am currently a third-year student of agroforestry at the University of Rzeszów. Since 2023, I have been volunteering in a project run by the National Science Centre (NCN, Poland) on the ecology of English oak in non-forest areas, mainly post-agricultural land. Initially, I planned to study architecture because I graduated from a technical school with a specialisation in landscape architecture, but due to my love of nature, I chose agroforestry. Once I gained experience, I realised that I was in the right place. My interests, in which I want to expand my knowledge, include botany, agriculture, forestry and ornithology. I spend my free time growing my own plants, especially vegetables.

Dariusz Kaniuczak, MSc, graduated with a master's degree in forestry from the Faculty of Forestry at the University of Agriculture in Krakow and with an engineering degree in agroforestry from the University of Rzeszów. Since 2022, I have been working as a National Science Centre (NCN, Poland) scholarship holder on a project concerning the development of English oak in non-forest areas, mainly post-agricultural land. Since 2023, I have been a contractor in the Ministry of Education and Science's 'Science for Society' project on geobotanical research of wetlands in the Lublin region using remote sensing methods. Since I have been interested in the natural environment from an early age, this led me to pursue studies in this field. The area of research that interests me most is soil science, specifically soil health and its impact on plant quality. As I have an education in agriculture and forestry, I believe that what farmers and foresters have in common is soil, the quality of which affects crop yields. I come from a family that ran a farm for many years, but due to its unprofitability, agricultural activity has been significantly reduced. Inspired by the knowledge I gained during my studies, I decided to take up farming and growing plants for my own use.

Multi-species, semi-natural grassland ecosystems as a food source for the honey bee *Apis mellifera* L. in south-eastern Poland

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Keywords: Przemyśl Footfils, Zamość Basin, Biodiversity, Meadow, Pasture, Semi-natural meadows, Nectar-bearing plants, Pollen plants, Honey yield of plants, Honey bee.

Abstract: The starting point for any beekeeping activity is an adequate forage base. The most desirable forage plants are those that provide large amounts of sugar-rich nectar, which in turn translates into the quality and quantity of honey produced. Pollen is equally important, as it is a source of amino acids for the bee family. Semi-natural meadows with a high proportion of leguminous plants and dicotyledonous herbs are considered a valuable source of forage for honey bees. A particularly large number of forage plants are found in meadows that are extensively used by humans.

The research was conducted on meadows and pastures in two mesoregions: the Przemysl Foothills and the Zamość Basin. Using the Braun-Blanquet method, 260 phytosociological photographs were taken in plant communities classified as *Molinio-Arrhenatheretea*. In the field, patches of vegetation with a high proportion of legumes and dicotyledonous herbs, which are of great interest to bees, were selected. Abundant nectar production by plants depends on abiotic and biotic factors. In order to determine these factors, habitat and microclimatic conditions were assessed using Ellenberg's phytocenotic method.

The physiographic conditions in the studied mesoregions differed from each other. In the Przemysl Foothills, meadows were found on the slopes and plateaus of hills with heights of 400-550 m above sea level, and in the Zamość Basin, on flat areas with heights of 195-220 m above sea level. As a result, the habitats in the Por Valley in the Zamość region were more fertile and better irrigated. The same plant communities were identified in the Przemyśl Foothills and the Por Valley: 7 communities from the *Molinietalia* order and 6 from the *Arrhenatheretalia* order. However, they differed in the number of honey plant species and the frequency with which they occurred in individual phytocenoses. Honey plants were more numerous and more frequent in warmer and sunnier locations, on south- and west-facing slopes and on hilltops. In contrast, tall grasses and sedges were more prevalent in the Por Valley. The species with the highest honey yield were*: Centaurea jacea* L., *Centaurea scabiosa* L., *Origanum vulgare* L., *Prunella vulgaris* L., *Knautia arvensis* (L.) J. M. Coult., *Solidago virgaurea* L., *Trifolium pratense* L., *T. repens* L., *Vicia cracca* L. The species differed in terms of flowering time. In spring, the most valuable sources of nectar for bees were: *Taraxacum officinale* F.H. Wiggers coll., *Plantago lanceolata* L., *Glechoma hederacea* L.,

Cirsium rivulare (Jacq.) All. and *Silene flos-cuculi* (L.) Greuter & Burdet, and in summer *Mentha arvensis* L., *Campanula patula* L, *Cirsium oleraceum* (L.) Scop., *Geranium pratense* L., *Heracleum sphondylium* L. and *Daucus carota* L. *Solidago gigantea* Aiton, one of the few early autumn forage plants, is controversial from the point of view of botanical ethics. It is also an invasive species that permanently alters plant communities in native phytocenoses.

The data presented here was collected and analysed as part of a study funded by the Ministry of Education and Science (MEiN, Poland), 'Science for Society II' No. NdS-II/SP/0588/2023/01, and based on the authors' own research.

Paweł Wolański, PhD in agricultural sciences, phytosociologist. For 25 years, he has been conducting geobotanical research on meadows and pastures, in rush and peat bog communities, on xerothermic grasslands and in other phytocenoses of southern and eastern Poland. He studies the use of grassland ecosystems in livestock nutrition. He is also involved in beekeeping.

Pesticide residues in pollen collected by *Osmia bicornis* in landscapes dominated by different cropping systems: apple orchards and rapeseed fields

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Keywords: *Osmia bicornis*, Solitary bees, Pesticide residues, Pollen, Pesticide Risk Index

Abstract: The red mason bee (*Osmia bicornis*) plays a vital role as a pollinator in agricultural and natural ecosystems. As a solitary species, it effectively pollinates a wide range of crops, including oilseed rape (*Brassica napus*), and apple trees, important for agricultural productivity. Numerous studies show that wild bees, including *O. bicornis*, substantially contribute to pollination supporting food production and ecosystem stability.

Despite its ecological significance, *O. bicornis* faces threats that may undermine its survival and pollination efficiency, and the intensification of agriculture, including the use of pesticides, contributes to these threats. Chemical residues are often found in pollen and nectar of treated crops, posing significant risks to adult bees and larvae.

In this study the level of pesticide residues in pollen collected by females to their offspring was assessed at two cropping systems: three *O. bicornis* sites were located near the oilseed rape field and three near apple orchard, all with different proportion of natural elements within a 1 km radius of a nest. Two nests per study site were studied.

The GC-MS/MS analysis detected pesticide residues in 11 out of 12 samples. Among the nests located near oilseed rape fields, insecticides (bifenthrin, chlorpyrifos, cypermethrin, deltamethrin), fungicide (kresoxim-methyl), and herbicide (pendimethalin) were found. Pollen samples from orchards were contaminated by insecticides (bifenthrin, chlorpyrifos, deltamethrin) and fungicide (kresoxim-methyl). Notably, chlorpyrifos, which has been banned in the EU since 2020, was found in 7 out of 12 samples, and two samples exceeded the permissible limit nearly 20-fold. The results from both GC- and LC-MS/MS analyses for each nest will be presented and a Pesticide Risk Index will be calculated to capture the combined hazard and exposure level to multiple substances in different cropping systems.

This research was part of the EU project PollinERA (HORIZON-RIA No. 101135005).

Dominika Twaróg, M.Sc. / PhD student: I hold two Master's degrees from Jagiellonian University in Kraków — one in Neurobiology and another in Environmental Protection and Management. While my first academic background was focused on biomedical research, I have always been drawn to environmental issues. This led me to pursue a second Master's degree and to shift my career path toward environmental sciences.

I am currently a PhD student at the Institute of Nature Conservation Polish Academy of Sciences, where I am working within the EU-funded project PollinERA. My research focuses on the effects of pesticides on pollinators, especially in the context of improving environmental risk assessment. I am conducting experiments on several species of wild bees and butterflies, investigating the impact of different exposure routes on the sensitivity of these insects to commonly used pesticides.

This is still the early stage of my scientific career, and this event is only my third conference. I'm looking forward to sharing the results of my work, learning from others, and establishing new research contacts in the field of pollinator ecology and ecotoxicology.

Flower strips as a tool for enhancing ecosystem services and sustainable pest control

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Keywords: biodiversity; natural pest regulation; ecosystem service delivery; wildflower strips; landscape complexity; plant–insect networks

Abstract: Sustainable agriculture is essential for ensuring long-term crop productivity while minimizing environmental impact. Modern farming practices must integrate ecologically sound methods to maintain key ecosystem functions, such as natural pest control. The use of specific plant groups that attract beneficial insects can enhance ecosystem services and improve the biological control of crop pests. One particularly effective approach to increasing biodiversity and the abundance of beneficial insects is the implementation of flower strips in agricultural systems. This study investigates the relationship between the species composition of flower strips, their flowering phenology, and the presence of beneficial insects - including wild pollinators, predators, and parasitoids - in agricultural landscapes of Central Europe and the Western United States. Results indicate that most plant species used in flower strips belong to the *Asteraceae* family. In the U.S., these are predominantly native species, whereas in Poland, both ornamental and native species are commonly used. Selecting plant species with staggered flowering periods from March to October ensures a continuous food supply for beneficial insects, while species that attract predators and parasitoids support consistent and effective pest control. Integrating such biodiversity-enhancing strategies into agricultural systems can reduce pesticide dependence and promote more resilient, sustainable farming practices.

Martyna Materowska, MSc, graduated in Biology from the University of Rzeszów, where she is currently employed at the Faculty of Biology, Nature Protection and Sustainable Development. Her scientific work focuses on insect overwintering strategies, including research on aphid diapause and the impact of climate change on this process. Throughout her career, she has completed numerous research internships both in Poland and abroad, including at the Swedish University of Agricultural Sciences in Sweden and in Madrid in Institute of Agricultural Sciences CSIC. In addition to her scientific and research activities, she is passionate about sharing her knowledge and actively engages in science outreach.

Internalization of external costs and benefits of agriculture: a practical evaluation

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Keywords: Sustainability assessment, Agricultural externalities, EU strategic dialogue, Profitability assessment, True cost accounting, Sustainable performance accounting

Abstract: This presentation explores key findings from economic research conducted within the DaVaSus project (Data- and value-based decision making for sustainable land-use) in Brandenburg,Germany. The project serves as a case study to evaluate methodologies for capturing agricultural externalities—costs and benefits not compensated through market mechanisms and not fully accounted for in the Common Agricultural Policy (CAP), yet bearing significant societal impacts. In response to recent strategic policy directives (EU Strategic Dialogue Report, September 2024, Vision Paper, February 2025), the project investigates two complementary approaches, which will be introduced in the presentation. The first approach is the measurement of real external effects in farming operations: multifunctional farming practices are being piloted, with their environmental effects on climate, biodiversity, and water assessed through a range of measurement techniques, from laboratory analysis to real-time sensor monitoring. Initial findings indicate trade-offs between scientific rigor and practical feasibility of measurement techniques, the difficulty of generalizing results across heterogeneous landscapes, and the potential of reference farms to estimate broader effects. The second approach comprises model-based calculation of externalities using farm data: Different methods for sustainable accounting (e.g. true cost accounting and sustainable performance accounting) are explored to translate externalities into monetary values. These models rely on standardized documentation of farm operations and financial indicators. The presentation provides insights into the different accounting methods using sample calculations for multifunctional farming practices and indicates limits to a widespread implementation such as the lack of data and interoperability standards, especially on small farms. The presentation concludes with a discussion of compensation mechanisms—both public and private—that could incentivize the internalization of externalities. These include regulatory thresholds, targeted subsidies (e.g., eco-schemes), and market-based instruments such as environmental credit trading systems. The DaVaSus presentation should contribute to the ongoing discourse on aligning agricultural policy with sustainability outcomes.

Does deagrarianisation influence rural community disintegration? Evidence from two Polish villages

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Keywords: Deagrarianisation, Rural community, Disintegration, Social bonds, Mutual help, Agriculture

Abstract: The aim of this presentation is to inquire whether deagrarianisation contributes to disintegration processes in the rural community. The article is based on ethnographic research of two villages in Poland, one with a more agrarian and one with a less agrarian character. The research encompassed interviews with villagers of different ages, in which they were asked to compare the present state of different forms of cooperation, mutual help and relationship with neighbours with memories from their childhood. It turned out that in both villages contacts and cooperation between members are in decline, but the residents of village B more often declared that neighborly help was still alive. I conclude that deagrarianisation might be one of the factors influencing the decline of cooperation, but there are also others, present in both villages: response to the shock of socio-economic transformation, transformation of agriculture (mechanization, rise of entrepreneurial farming), social differentiation and use of electronic media.

Aleksandra Bilewicz, PhD, is an adjunct in the Institute of Rural and Agricultural Development, Polish Academy of Sciences. Her research concentrates on sociology of agriculture (among that social aspects of deagrarianisation, repeasantisation) and the social history of the cooperative movement. She is the author of the book "Społem 1906-1939: idea, ludzie organizacja" about the prewar Union of Consumer Cooperatives in Poland "Społem" and a co-editor (with Bartłomiej Błesznowski) of the academic book series Kooperatyzm (Cooperativism). She has published her work in leading rural studies and other journals, such as Sociologia Ruralis, Journal of Rural Studies, Journal of Peasant Studies. She is a member of the Polish Young Academy.

Land use conflicts in the multifunctional countryside

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Keywords: farmers' perceptions, potential land use conflicts, rural neighborhood, multifunctional countryside, discrete choice experiments, Poland

Abstract: Recent research confirms the growing scale and frequency of land use conflicts in rural areas. Such conflicts primarily affect rural areas and farmland due to urban expansion or transformations towards multifunctionality. As conflicts between farmers and other stakeholders tend to increase while farmland resources continue to shrink, spatial planning and the legal protection of agricultural land have become key policy priorities. Therefore, it is crucial to recognize and understand how farmers perceive their neighbors who represent different land use functions - residential, economic, tourism, and conservation - and to explore the tensions that may arise between actors in the multifunctional countryside. Nevertheless, in-depth, quantitative analyses of farmers' perceptions in this regard are still lacking. To fill this gap and explore farmers' perceptions of the most conflicting types of neighborhoods, we used discrete choice experiment methods on a representative sample of 960 farmers in Poland. Data were collected in 2023 in the Warmińsko-Mazurskie Voivodship, a region selected for its distinctive socio-economic profile, characterized by a coexistence of well-developed agricultural, nature conservation, and tourism functions. The research sample included 14 municipalities with varying levels of deagrarianization. The results indicate that the nature of farmers' neighborhoods – particularly the presence of residential, economic or tourism-related land functions - significantly influences farmers' perceptions of potential conflict. High-intensity residential and economic activities are especially perceived as sources of tension. These perceptions vary markedly according to individual characteristics (e.g., farm size, production type) and spatial context (e.g., farm location). Farmers engaged in livestock production, managing larger farms, or operating in areas with advanced deagrarianization or within protected zones are more likely to view neighbors representing other land use functions as potential sources of conflict.

Dominika Milczarek-Andrzejewska is Associate Professor at the Faculty of Economic Sciences at the University of Warsaw, specializing in institutional economics, political economy, and food economics. Her research explores land markets, conflicts over agricultural land use, and the organization of the food supply chain. Her work combines theoretical insight with empirical analysis to address contemporary challenges in agri-food systems and land governance.

She has participated in several research projects funded by the European Commission and the National Science Centre (NCN, Poland), focusing on economic and social aspects of agriculture and food systems. She is involved in interdisciplinary research projects combining perspectives from economics, sociology, and public policy and regularly presents her work at national and international conferences.

At the University of Warsaw, she teaches courses in economic theory and policy, with a special focus on institutional and agricultural economics, and she mentors students at both undergraduate and graduate levels.

Regional collaboration in practice-oriented research: insights from several case studies

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Keywords: Practice-oriented research, Regional collaboration, Cross-case analysis, Rural context, Urban context

Abstract: This practice-oriented research investigates collaborative partnerships in both rural and urban contexts through a series of case studies. Rural cases include the Duin- en Bollenstreek region, the Municipality of Altena, and a farmer collective. Urban cases involve municipalities such as Rotterdam, Amersfoort, 's-Hertogenbosch, Tilburg, and Deurne. The aim of this study is to synthesize insights across these diverse contexts and to understand how various forms of collaboration contribute to transitions in agriculture and spatial development.

Most case studies employed participatory action research, research through design, or exploratory methods to actively engage stakeholders in shaping outcomes. In many cases, students from the applied university HAS Green Academy were involved, integrating research with education. Each case is described along with the research approach used, and a cross-case analysis was conducted using a shared analytical framework.

In rural areas, the findings emphasize the importance of developing a shared vision as the basis for effective collaboration. Partnerships among farmers and local stakeholders also help to distribute risks associated with the agricultural transition, thereby enhancing resilience and adaptability.

In urban contexts, the research shows that collaboration around a shared theme is equally crucial. It creates a setting in which all practice partners can contribute their expertise and interests. Through constructive dialogue, these differences lead to integrated and context-specific outcomes.

These case studies demonstrate that participatory methods and joint visioning can foster more inclusive, resilient, and sustainable transitions in both rural and urban environments. Additionally, this type of practice-based research not only delivers valuable real-world outcomes but also plays a vital role in keeping higher education curricula relevant, applied, and future-oriented.

Aafke Schaap, MSc, is a researcher and lecturer at the HAS green academy, University of Applied Sciences. She is affiliated with the research group Earning Capacity for Regenerative Farming. Within this group, her work focuses on regional collaboration to support regenerative agriculture. Her research is practice-based and participatory: the research groups at HAS are actively involved in many regional partnerships, and the researchers contribute by connecting theory with practice and supporting the establishment and development of such collaborations.

Paul van der Donk is also a lecturer and researcher at the HAS green academy. His expertise lies in regional development, particularly in urban settings. Over the years, he has gained extensive experience in facilitating and studying collaborations that aim to strengthen local and regional resilience.

In the coming years, Aafke and Paul will combine their insights into various (regional) collaborations—both rural and urban—through which they aim to accelerate regenerative agriculture and promote sustainable, healthy regional development.

At the conference in Poland this September, they look forward to sharing ideas about regional as well as international collaborations, and to being inspired by the diverse contexts in which regional development takes place.

The contribution of agricultural ecosystems to soil fertility, water regulation, and biodiversity conservation in Uganda

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Keywords: Environmental sustainability, Water regulation, Agroforestry, Integrated farming, Soil fertility, Biodiversity conservation

Agricultural landscapes in Uganda are essential to the provision of ecosystem services which play a key role towards environmental sustainability and rural livelihood. It is upon these diversities in benefits of Uganda's agricultural landscapes in relation to providing ecosystem services such as soil fertility, water regulation, biodiversity conservation, and resilience to climate that this paper is developed. These services enhance agricultural productivity and smallholder farmers' capacity to achieve self-sustainability. Through a sequence of case studies and empirical realities, the paper shines light on how sustainable land management, agroforestry, and integrated farming systems contribute to enhancing crop productivity, reducing dependency on external inputs, and building resilience to climate uncertainty. Moreover, research delves into the socio-economic impacts of ecosystem services to rural development via food security, diversification of income, and empowerment of people. The study underscores the importance of policy support and knowledge transfer to upscale sustainable agriculture. In conclusion, Uganda's agricultural landscapes, if managed sustainably, are vital ecological and economic assets that can be used to stimulate long-term development and make farmers more autonomous.

Ndugwa Collines is NAADS Development Projects Coordinator for Wakiso District Office in Uganda. He has a Diploma in Agriculture and Rural Development from Bukalasa Agriculture Institute, and more than 6 years of experience in agricultural implementation, planning, and community-based development.

Collines is presently responsible for coordinating and managing the implementation of NAADS-funded agricultural development programs in Wakiso District. His work involves improving smallholder farmer productivity through availing quality agricultural inputs, capacity building, as well as promoting innovation in agriculture to adapt to local conditions. He has a particular interest in rural livelihood transformation through agribusiness, sustainable agriculture, and youth and women empowerment initiatives.

Under his leadership, a number of projects have successfully enhanced food security and household incomes in Wakiso, with the proof of enhanced crop and animal production yields, as well as access to markets. Collines is also an advocate of farmer-driven extension systems and constantly works with farmer organizations, local authorities, and NGOs to promote inclusive and participatory development.

Strengthening local food systems through community supported agriculture: enhancing food security and fostering direct farmer-consumer relationships

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Keywords: Community Supported Agriculture (CSA), Food security, Smallholder farmers, Sustainable agriculture, Production security, Local partnerships, Agricultural policy

Abstract: Community Supported Agriculture (CSA) has been well regarded worldwide as an innovative approach to building strong local food systems, improving food security, and developing direct farmer-consumer relationships. In Uganda, where food insecurity, uncertain agricultural production, and economic risk are widespread, CSA is an effective response to meeting society's complex needs, local food security, and producers' production security. This article discusses CSA's potential to address such needs in Uganda by enhancing rural and urban communities' food access and creating a secure income for farmers. Based on case studies and qualitative data, the article investigates how Ugandan CSA initiatives have emerged as promising alternatives to precarious markets, climatic unpredictability, and socio-economic disparities. Further, the research reflects on CSA's ability to enable smallholder farmers to scale up production regimes, crop diversification, and direct sales to local markets, improving sustainable livelihoods and farm productivity. The research also elucidates the role of community engagement, local networks, and policy contexts in scaling up CSA programs and their long-term maintenance. It provides evidence from the potential of CSA not only to construct farmers' resilience and food security but also to construct a better relationship between consumers and farmers. The paper finally provides recommendations to practitioners and policy-makers for uptake of CSA into Uganda's agricultural development agendas, towards constructing the food system in the future as more inclusive, secure, and resilient.

Kalule Richards Tevin is a Professional Agricultural Development Specialist working with the National Agricultural Advisory Services (NAADS) Wakiso District Office in Uganda-East Africa. He holds a Bachelor's Degree in Agricultural Extension and Rural Development from Bugema University and has over ten years of experience rolling out sustainable agriculture initiatives for improved rural livelihoods. In addition , He is a freelance journalist (Diploma), social activist and a board member of Ssempangi Foundation Inc and Atin Afrika Foundation-Uganda.

His responsibilities primarily entail designing, implementing, Promoting adoption of technologies, Strengthening farmer institutions and monitoring NAADS-funded agriculture programs, including input distribution, farmer training, and support for agribusiness development. He has played a key role in managing programs support for modern farming, value addition, and market linkages for small-scale farmers in Wakiso District.

With a deep interest in rural transformation, He collaborates with farmer groups, community leaders, and development organizations to make agriculture interventions pragmatic, efficient, and inclusive. His contributions have done much to improve productivity, food safety, and incomes for farmers.

Beyond his official duties, Tevin has a strong commitment to empowering women and youth in agriculture and is actively involved in mentorship and community outreach programs.

Photovoltaic and wind farms as a source of land-use conflict: consequences for agriculture, biodiversity and rural communities

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Keywords: land use change, photovoltaics, wind farms, agriculture, agro-photovoltaics, biodiversity

Abstract: Energy transition, which involves the intensive development of photovoltaic (PV) installations and wind farms, is causing growing land-use conflicts in agricultural areas. These conflicts have ecological (loss or modification of habitats), economic (loss of arable land, changes in land value), and sociocultural dimensions (weakening the sovereignty of local farms). Global and regional analyses show that inappropriate locations and the lack of participatory and compensatory mechanisms deepen the tensions between food production and energy production [1]. For organisms and ecosystem functioning, the conversion of fields to PV installations leads to direct and indirect changes in habitat conditions: disruption of vegetation structure, modification of the microclimate (lighting, temperature, soil moisture), and changes in soil parameters. As a result, shifts in plant species composition are observed (decrease in photophilous species under panels, increase in biomass in the spaces between rows) and variable responses of invertebrate communities – from significant increases in pollinator abundance in zones planted with nectar-producing plants to a decrease in soil microfauna diversity where the ground was intensively prepared before installation [2, 3]. Wind farms typically occupy a relatively small permanent area of expropriated land, allowing for the continuation of grazing or cropping between turbines. However, these installations generate specific threats – primarily an increased risk of collisions and mortality for birds and bats, as well as potential habitat fragmentation, particularly in sensitive areas (migration corridors, peat bogs). Effectively reducing biological losses requires risk factor analysis and the implementation of mitigation practices, such as setting a higher threshold wind speed at which the turbine starts spinning, during the period of bat activity [4, 5]. From the perspective of farmers and local communities, these transformations mean: (i) direct loss of arable land and income, (ii) changes in local food value chains (limited local supply), (iii) pressure to transform the management model (e.g., switching from food production to lease or lease payments for renewable energy). The literature suggests solutions that minimize land-use conflicts and negative ecological impacts: (1) prioritizing the location of renewable energy sources in already degraded or unproductive areas, (2) implementing combined systems (agro-photovoltaics) that enable simultaneous energy production and preservation of agricultural and habitat functions, (3) maintaining and restoring strips of natural vegetation and ecological corridors around installations, (4) mechanisms for social participation and fair compensation for farmers [6, 7]. In summary, to balance energy and agricultural goals and protect biodiversity, interdisciplinary policy combining spatial planning, environmental risk assessment, public

participation mechanisms, and agroforestry/agro-photovoltaic practices are necessary. This policy should promote the use of degraded land, standards for minimizing biological losses, and economic instruments that support small farms in adapting to the transition.

1. Lafitte, A., et al. 2023. Existing evidence on the effects of photovoltaic panels on biodiversity: A systematic map with critical appraisal of study validity. *Environ. Evid. 12, 25.*
2. Armstrong A., et al. 2016. Solar park microclimate and vegetation management effects on grassland carbon cycling. *Environ. Res. Lett. 11 (74016).*
3. Graham, M., et al. 2021. Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. *Sci. Rep. 11* (*7452).*
4. Kunz, T. H., et al. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Front. Ecol. Environ. 5, 315–324.*
5. Arnett, E. B., et al. 2011. Altering turbine speed reduces bat mortality at wind-energy facilities. *Front. Ecol. Environ. 9, 209–214.*
6. Liu, H., et al. 2023. How to balance land demand conflicts to guarantee sustainable land development. *Iscience, 26 (106641).*
7. Gasparatos, A., et al. 2017. Renewable energy and biodiversity: Implications for transitioning to a Green Economy. *Renew. Sustain. Energy. Rev. 70, 161–184.*

Beata Ciak-Wojdyła, PhD student at the Faculty of Biology, Nature Conservation, and Sustainable Development at the University of Rzeszów. Her research focuses on the impact of global environmental changes, particularly rising temperatures, on the biochemistry and functional traits of forest herbaceous plants. She employs a wide range of plant material analysis techniques, including biochemical, spectroscopic, and chromatographic methods. The aim of her work is to deepen understanding of the mechanisms underlying plant adaptation to changing environmental conditions, with potential applications in ecology, nature conservation, and forest management. She has completed a research internship at the Department of Plant Functional Metabolomics of the Polish Academy of Sciences in Poznań and has participated in numerous training courses and specialized workshops in Poland, expanding her expertise in modern research methods and ecological analyses.

Method of manure application alters the soil microbiome

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Keywords: Microbiology, Manure, Digestate, Pasture, Dairy farm, Slurry

Abstract: Injection of liquid manure and digestate is mandatory in the Netherlands to reduce ammonia emissions. However, the impact of this measure on microbial soil health in the topsoil is still mostly unknown. Sod injection of manure is under discussion among some farmers, as they believe it has a negative effect on soil and crop health. Under strict conditions, such as reduction of chemical fertilizer application, these farmers are allowed to apply manure above ground. To gain insight in the effects of manure injection on soil health, the microbial composition of the topsoil of pastures from 15 dairy farms from the North of the Netherlands was determined using Illumina sequencing. In total three different types of manure (solid, digestate, slurry) were examined that were applied either above ground or through injection. Soil samples were collected before the first manure application and after subsequent applications over multiple years under different weather conditions. It was found that applying manure above ground significantly increased the relative abundance of arbuscular mycorrhiza and species that are involved in nitrogen fixation and plant growth promotion, while no difference in the total amount of nitrogen in the soil was observed compared to manure injection. This indicates that biological nitrogen fixation makes up for the lower application of chemical fertilizer application on these fields. On the other hand, applying slurry or digestate through injection increased the relative abundance of species involved in nitrification. Interestingly, it was found that digestate might stimulate the plant growth promoting fungus Trichoderma. The results indicate that applying manure above ground could be an interesting opportunity for farmers to make agricultural soils less dependent on chemical fertilizer while also becoming more resilient to abiotic stress such as drought.

Jidske Knigge (MSc) is a soil microbiologist with a Master's degree in Molecular Life Sciences from Wageningen University. Since 2021, she has been part of the soil health team at Bioclear earth in Groningen, Netherlands, where she and her colleagues use their expertise to advance sustainable agricultural practices. Jidske has a special interest in investigating the relationships between microorganisms and soil health. She is particularly passionate about unraveling how farmers can harness the beneficial functions of bacteria and fungi in the soil in order to reduce the need for chemical fertilizers, pesticides and to enhance crop growth. With the quick advancement of DNA technologies and AI-based tools Jidske thinks that the importance of soil microbiology will become more clear in the coming years. She is looking forward to gain more insights in the effect of different farming practices on soil microbiology and to translate them into concrete advise to farmers, thereby supporting the transition towards a more sustainable agricultural system.

The potential of soybean cultivation in the era of current climate changes in Poland and Europe

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Keywords: Soybean cultivation, Climate change, Yield potential, Adaptation strategies.

Abstract: Soybean (*Glycine max* L. merrill), one of the world's most important leguminous crops, is gaining increasing relevance in Poland and Europe due to climate change and shifting agricultural policies. Rising temperatures, longer frost-free periods, and elevated atmospheric CO_2 concentrations have expanded the potential range of soybean cultivation into regions previously considered marginal. Climate models project an increase of 2–4°C in Poland by mid-century, creating favorable conditions for higher yields, although risks such as drought, heat stress, and pest pressure remain significant. Successful cultivation depends on adequate soil temperatures for germination, sufficient water availability during germination and pod filling, and the development of short-season, drought-tolerant cultivars. Expansion of soybean acreage in southern and western Poland is supported by EU policy incentives, the demand for non-GMO protein sources, and the environmental benefits of nitrogen fixation. However, irregular rainfall patterns, increased pest prevalence, and competition with imported soybeans pose challenges. Simulation models suggest that, under optimal management, climate warming could increase soybean yields in Poland by 10–30% by mid-century. Overall, soybean cultivation in Poland and Europe shows strong potential for growth, but its sustainability will require continued breeding efforts, integrated pest management, and adaptive farming practices aligned with climate projections and EU agricultural strategies.

Tomasz Lachowski, M.Eng. in Agriculture and Horticulture, currently a fourth-year PhD student at the Doctoral School. His research focuses on the impact of micronutrients on soybean yield under Polish climatic conditions. He is passionate about agriculture, particularly agricultural technology, crop and vegetable cultivation, and the effective use of fertilizers and plant protection products. He has participated in a one-month scientific internship at Universidad Complutense in Madrid and a six-month traineeship at Universidad Politécnica de Valencia. His hobbies include books and cycling.

Workshops

TRADITIONAL ECOLOGICAL KNOWLEDGE

led by Zsolt Molnár, HUN-REN Centre for Ecological Research, Institute of Ecology and Botany, Vácrátót, Hungary, molnar.zsolt@ecolres.hu

I will show best practices to inspire ways to foster recognition for traditional knowledge (TK) holders and their knowledge, worldviews and values, promote the inclusion of plurality of values and voices in the media and school curricula, encourage meaningful participatory decision making, mobilise strategies to re-design and decolonize financial support mechanisms, decrease bureaucratic loads, and promote TK holder-led conservation activities. Supporting TK holders and keeping traditional land management practices alive should be considered as a social justice imperative of great strategic importance for long-term social-ecological resilience in Europe. An additional topic we can discuss is that if we focus more on botanical, ecological research we will find unexpected research gaps for example, between rangeland/livestock science and conservation biology/vegetation ecology. This gap has led to a lack of evidence needed for grazing-related conservation management of pastures, forests and marshes. Connecting scientific understanding with traditional ecological knowledge of local livestock keepers could help bridge this research and knowledge gap. In one of our studies in Hungary, we found that cattle grazing on species-rich pastures displayed at least 10 different behavioural elements as they encountered 117 forage species from highly desired to rejected. The small discrimination error suggests that cattle recognize all listed plants 'by species'. We also found that herders had broad knowledge of grazing desire and they consciously aimed to modify desire by slowing, stopping or redirecting the herd. Modifications were aimed at increasing grazing intensity in less-desired patches and decreasing grazing selectivity in heterogenous swards. The traditional herd management practices had significant conservation benefits, such as avoiding under- and overgrazing, and targeted removal of pasture weeds, litter and encroaching bushes, tall competitive plants and invasive species. We will discuss how knowledge co-production with TK holders who belong to another knowledge system could help conservation, through co-designing research projects and working together in data collection, analysis and interpretation. Stronger links between scientists and TK holders could help develop evidence-based, specific conservation management practices while TK holders could contribute with their practical experiences.

RURAL LANDSCAPE ARCHITECTURE: SKETCHING CULTURAL LANDSCAPE

led by Johan Meeus, Arnhem, The Netherlands

Landscape characters are narrative concepts to organize natural and man-made forms as a complementary whole. Scenery and composition can be seen as the visual identification of the coherence between natural and anthropogenic processes and patterns. The degree of openness and naturalness reveals the influence of cultivation. The character of a landscape is made up of all those qualities that make a place different from others.

"The existing mosaic of arable lands, grasslands, orchards, fruit tree plantations and numerous hedgerows (trees and shrubs) along agricultural terraces, occurring in the loess areas of SE Poland, constitute in our opinion an example of traditional agroforestry systems". (B. Baran-Zglobicka & W. Zglobicki. (2012) Mosaic landscapes of SE Poland: should we preserve them? Agroforest Syst 85:362)

Making sketches to analyze and visualize

In search for identifiable cultural landscapes, we are going to sketch with pen and pencil.

— Take some pictures from a private farmyard to a public open space of a place you love.
— Sketch the eye-level perspective of that landscape with foreground, functional space in the middle and vista on the background.
— Look for shape, depth, relief, slope, crop, plantation, trees, buildings, space, structure and contrast.
— The better you know the place, the easier to sketch the whole region in one picture.
— 'Picture make perfect': try it at least three times and take the best sketch.
— What is the most suitable name for the regional landscape you sketched?
— Evaluate and discus the visualization, location and narrative with co-workers.

IS THERE SPACE FOR MIXED, SMALLHOLDER FARMING IN THE MODERN WORLD? DO WE NEED IT?

led by Stephen G. Bramwell, Washington State University, and Andrzej Bobiec, University of Rzeszów

"Smallholder farming" is often perceived as economically inefficient. However, is it inefficient per se, objectively, or because of economic systems and policy that are shaped to support intensive commodity farming? What is the measure of "efficiency": The crop yield regardless of the involved subsidy volume (irrigation, fuel, fertilisers, pesticides, etc.)? The acreage of farmland operated by one farmer? Sustainable use of the natural productive and regenerative potential of soils and landscapes? The size and health of the population subsisting on an area of land?

Further, can we afford high-input, environmentally harmful global food production and trade, while spending more and more on biodiversity conservation? Or can investment in smallholder agriculture help balance food production and the environment while avoiding political instability and supporting rural livelihood?

During the workshop we will try to address the above questions and to reflect on the role of smallholder farming as a factor of ecological, economic, and social resilience and security in the shaky global realm. What should be done to unleash the potential of smallholder farming?