Exploring Sustainability Implications of Transitions to Agroecology: a Transdisciplinary Perspective

Explorer les implications des transitions vers l'agroécologie pour la durabilité : une perspective transdisciplinaire

Auswirkungen des Agrarökologischen Wandels auf die Nachhaltigkeit: eine transdisziplinäre Sichtweise

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Context for transitions to agroecology

Agroecology is being promoted at EU-level (European Commission, 2022) and represented in national CAP strategic plans (e.g. MASA, 2022), setting an expectation for the contributions it can make to achieving policy aims of tackling climate change, reversing the loss of biodiversity and reducing social inequalities. This paper reflects on findings of a study – project H2020 UNISECO – that aims to understand and improve the sustainability of agroecological farming systems in the European Union, and how they contribute to achieving wider aims of sustainability.

Current food systems have led to the depletion of resources and negative environmental impacts (Rockström *et al.*, 2020). The extensive use of agrochemicals, heavy machinery, water, and the increasing reliance on fossil fuels in general has contributed to destabilising the ecosystem processes which are the basis of agricultural production. The intensification and greater homogeneity of agroecosystems have led to an increasing dependence on such external inputs. Thus, several experts and high-level commissions have concluded that a transformation is necessary (Brunori *et al.*, 2020).

> “Les transitions vers l'agroécologie offrent des avantages pour plusieurs objectifs et cibles de développement durable, si elles sont soutenues au niveau des systèmes alimentaires.”

In recent years, greater prominence in scientific, agricultural and political discourse has been given to agroecological practices and a focus on healthy agroecosystems with optimised internal ecological processes instead of external inputs. Pathways have been suggested to transform to farming and food systems that address these issues (Wezel *et al.*, 2020). However, such pathways need to be tailored to context specific combinations of practices. If applied in an unsuitable context or not tailored to a given context, agroecological practices can lead to detrimental effects. For example, no-tillage management practices can involve trade-offs between different measures of water quality depending on the environmental circumstances in which it is applied (Skaalsveen, Ingram and Clarke, 2019). Context-specific socio-economic and policy barriers can also act as constraints on adopting agroecological practices (Gava *et al.*, this issue).

The Food and Agriculture Organisation of the United Nations (FAO) views the scaling up of transitions to agroecology to the territorial level as playing a key role in a sustainable transformation of food systems and achieving several of the UN Sustainable Development Goals (SDGs). Within the UNISECO project, a scenarios approach was used to explore what future food systems those transitions may represent. Scenarios, 'plausible descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key relationships and driving forces' (Nakicenovic and Swart, 2000), are a useful tool for considering the implications of a plan

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or management decision across a range of future possibilities (Miller *et al.*, 2020; Steinitz *et al.*, 2003). Few scenario studies have dealt with agroecology specifically. One example is that of Poux and Aubert (2018) who developed and modelled a scenario in which dietary change allowed for reduced yields and thus widespread implementation of agroecology. This scenario led to GHG emissions being reduced by 40 per cent while maintaining export capacity, conserving natural resources and restoring biodiversity.

Engaging stakeholders in developing scenarios can be an effective way of creating new knowledge and contextualising information, in this case applied to the transformation of food systems at a territorial level and including aspects of social desirability (Kok, Biggs and Zurek, 2007). The UNISECO project developed transdisciplinary research in case studies in 15 countries across Europe to understand the potential of adopting agroecological practices to deliver public goods through socio-economically viable farming systems in specific geographical contexts (Gava *et al.*, this issue). The case study analysis was complemented by participatory scenario development and assessment of the biophysical feasibility and ecological and socioeconomic impacts of the large-scale adoption of agroecological practices in the EU (Mayer *et al.*, this issue; Röös *et al.*, 2022). In this article the results of the 15 case studies of transitions to agroecology provide evidence from local contexts to explain the findings from the assessment of an upscaling of agroecological practices to the territorial level with the aim of exploring potential contributions towards achieving the UN SDGs.

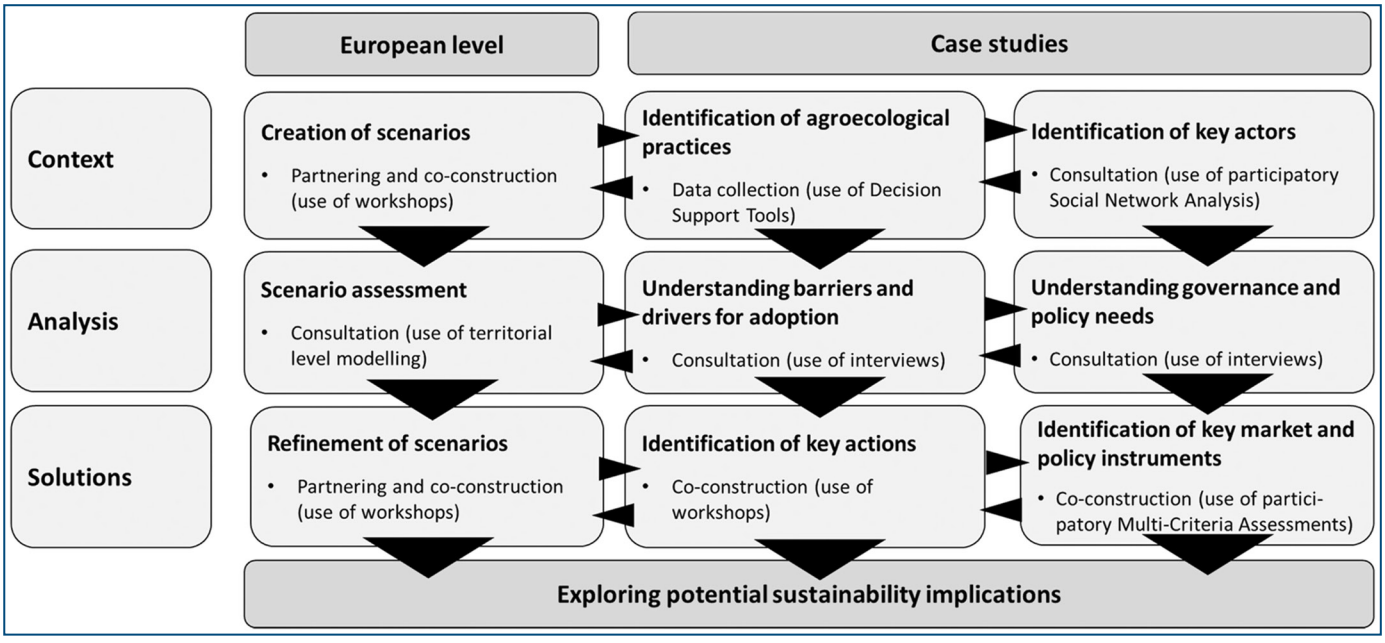
> “Der Übergang zur Agrarökologie bringt Vorteile für mehrere SDGs, wenn er auf der Ebene der Lebensmittelsysteme unterstützt wird.”

Bringing together complementary perspectives of key actors

A transdisciplinary approach is increasingly called for and supported by funders, end users of research, and scientists to gain a shared understanding of how to address the transformation of food systems (Sattler *et al.*, 2022). In UNISECO, the transdisciplinary framework was implemented through Multi-Actor Platforms (MAPs) at European and case study levels. This two-level approach provided a structure to enable timely engagement with relevant actors in the co-construction of strategic pathways for transitions towards agroecology (Figure 1).

The European level MAP comprised representatives from DG Agri, DG ENV, FAO, European Network for Rural Development, European Forum on Nature Conservation and Pastoralism, WWF European Policy Office, Groupe de Bruges, Standing Committee on Agricultural Research, EcoAgriculture Partners, and European Forum for Agricultural and Rural Advisory Services. A European level context was established through workshops to develop scenarios for future European food systems (Figure 1). This context provided the foundation for the improved understanding of: i) barriers and drivers of adoption of agroecological practices and the governance and policy needs of transitions to agroecology in the case studies, and ii) scenarios of large-scale implementation of agroecological practices in the EU. The improved understanding enabled MAP members in the case studies to co-construct

Figure 1: Transdisciplinary approach of co-learning activities for co-constructing strategies for transitions towards agroecology



Source: Authors' own elaboration.

solutions for addressing barriers to and drivers of transitions to agroecology, and to identify market and policy incentives supporting such transitions across the diversity of the case study contexts. Their combination with EU-level perspectives of scenarios informed exploration of the contributions towards achieving the UN SDGs.

The case studies were conducted in Sweden, Finland, Latvia, Lithuania, Czechia, Hungary, Romania, Greece, Italy, Austria, Switzerland, France, Spain, UK and Germany. The individuals invited to participate in the MAPs in the case studies included farmers, representatives of farming advisory services, policy and public administration, companies along the supply chain, NGOs and researchers. Candidates were identified through existing vocational networks, screening for relevant actors in the case study areas and recommendations of the stakeholders (Irvine *et al.*, 2019). The final selection of members was based on a review against a set of criteria including the relevance to the case study, commitment, appropriateness, representativeness, interest and willingness, as well as gender, age and geographical spread (for further details of the selection procedures see Budniok *et al.*, 2018). The processes and impacts of interactions with the MAPs and relevant actors involved in the participatory activities during the project were monitored and evaluated by applying different sets of criteria for preparation, implementation and post-implementation stages (Smyrniotopoulou and Vlahos, 2021). The composition and operation of the MAPs are explained in more detail in Zawalińska *et al.* (this issue).

Empirical data collection on agroecological practices using Decision Support Tools such as the SMART (Sustainability Monitoring and Assessment RouTine) Farm Tool and Cool Farm Tool (Landert *et al.*, 2020; Niedermayr *et al.*, this issue), and consultations on identifying key actors in the transition, provided the context for the co-construction of strategic pathways for transitions to agroecology in the case studies.

Insights to sustainability implications of transitions to agroecology

The analysis of sustainability implications was co-constructed with the MAPs using scenarios and biophysical (BioBAM and SolM) models (Muller *et al.*, 2020) and macroeconomic modelling of agroecological transitions with respect to food systems (Röös *et al.*, 2021); empirical observations and participatory analysis using decision support tools (Albanito *et al.*, 2021); and multi-criteria analysis (Gava *et al.*, this issue) at case study level.

The scenarios were designed to provide contexts of alternative futures in which different combinations of conventional and agroecological farming and food consumption practices were assessed. With the input from stakeholders, five scenarios were developed along two axes of low to high levels of implementation of agroecological practices, and global to local food systems (i.e. level of trade within the EU and globally) which emerged in workshops of the two levels of MAPs (Röös *et al.*, 2022). The positioning of the scenarios is presented with respect to the two axes in Figure 2.

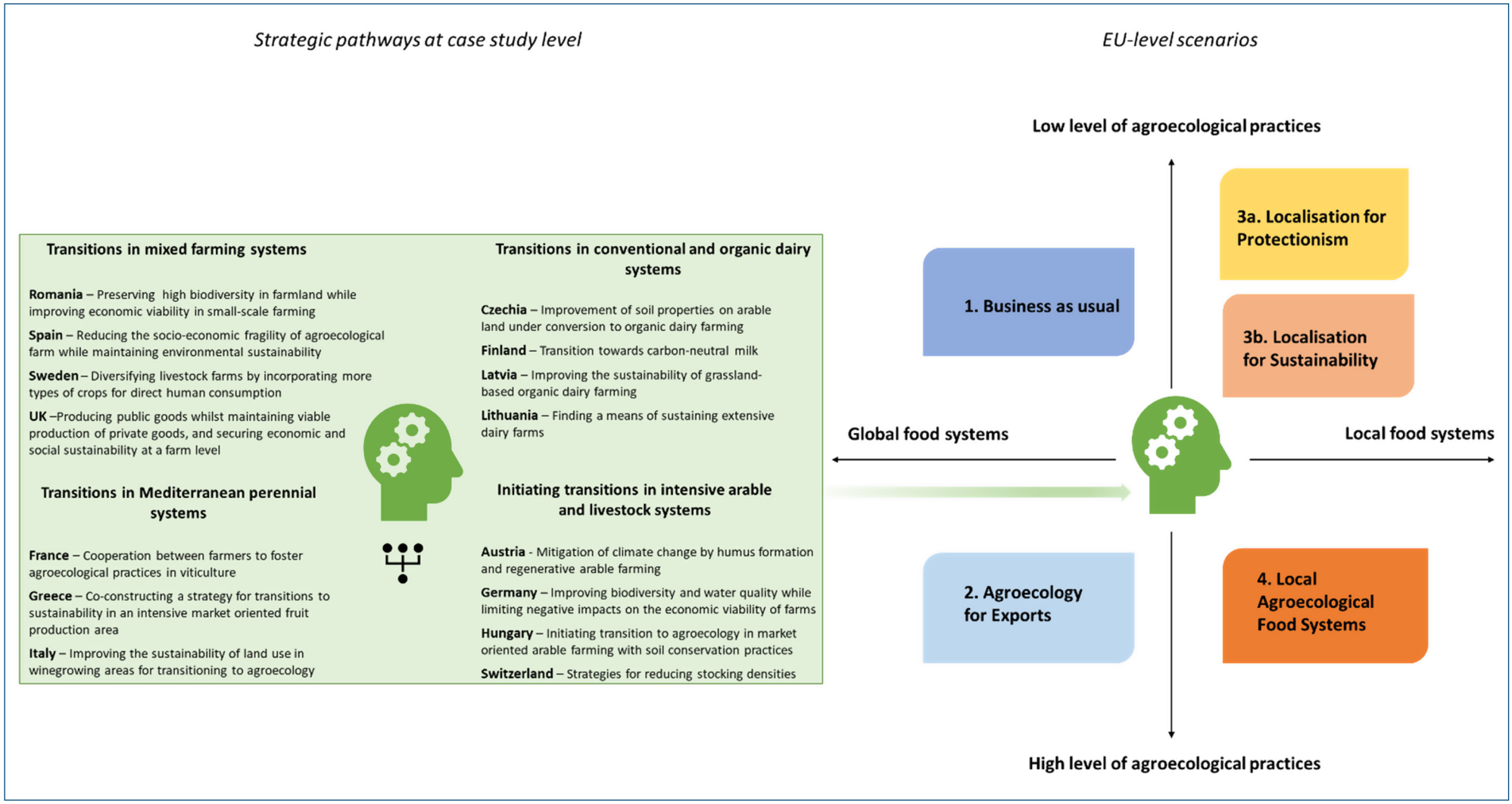
The scenario Business-as-usual continues the dynamics and critical aspects of current agri-food systems. Scenario Agroecology-for-exports depicts a future in which policy and market actors promote agroecological approaches as a marketing strategy. Two scenarios (Localisation for Protectionism, and Localisation for Sustainability) are based on more localised food systems being given priority over agroecological practices, but for different reasons. In the scenario Localisation-for-Protectionism, rising nationalism and protectionism call for further re-nationalisation of agricultural production and policies. In the scenario of Localisation-for-Sustainability an ambition prevails of increasing food system sustainability by cutting food miles and diversifying local production systems (see also Pretty, Toulmin and Williams, 2011).

The scenario Local-agroecological-food-systems reflects the implementation of more advanced stages of transitions to agroecology, called 'redesign'. It centres around the implementation of 'stronger' agroecological practices such as biodiversity-based solutions and a redesign of current farming systems, in contrast to weak practices which are mainly limited to improved efficiency and precision in the use of inputs and substituting synthetic chemicals with organic variants (Röös *et al.*, 2021).

> "Transitions to agroecology deliver benefits across several Sustainable Development Goals and Targets, if supported at food systems level."

The co-construction of strategic pathways in the case studies and territorial scenarios (Figure 2) enabled the co-learning of several sustainability implications that may result from the adoption of agroecological practices. The strategic pathways are designed to facilitate the implementation of agroecological practices that are suitable to address key sustainability challenges in a range of farming systems across the case studies covering mixed farming systems, perennial, dairy, livestock, and arable systems. Examples are: i) improvement of the economic viability in high biodiversity small-scale mixed farming through increased market access through cooperation (Romania); ii) transitions towards carbon-neutral milk production through an improved economic valuation of manure input and valorisation of biogas digestates (Finland); and iii) mitigation of climate change by supporting humus formation at the systems level and strengthening knowledge networks on regenerative arable farming (Austria) (see also Zawalińska *et al.*, this issue). The strategic pathways respond to the main themes of barriers which inhibit agroecological transitions of: i) actor capacity; ii) value chain; and iii) policy (Gava *et al.*, this issue).

Figure 2: Overview of strategic pathways at case study level and EU-level scenarios



Source: Based on authors' own elaboration and Röös *et al*. (2021).

The strategic pathways co-constructed in the case studies were combined with scenarios of food systems in the EU in 2050, in which different combinations of conventional and agroecological farming and food consumption practices were assessed (Röös *et al.*, 2021). These were then reviewed with respect to selected UN SDGs as a reference for discussion with stakeholders on the adoption of the positive and negative sustainability implications that may result from the agroecological practices. Reflecting the cross-cutting nature of agroecology, direct sustainability implications were identified for several SDGs (Table 1).

Evidence collected in local case studies demonstrates that unique combinations of agroecological practices can realise synergies (e.g. biodiversity-friendly and climate-friendly farming practices). In diversified farming systems, such synergies offer prospects of farm viability as well as contributing to the stable supply of food for local consumers. For example, reductions in yields per hectare in cropping systems could be offset by ceasing the rearing

Table 1: Key sustainability implications of local agroecological strategies and territorial scenarios *(Blue cells: positive implications; yellow cells: negative implications)*

SDGs	Strategic pathways at case study level	EU-level scenarios
SDG2 - End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Diversification of farming systems, reduced feed-food competition, and short supply chains, based on proximity and seasonality of production may contribute to a stable supply of food for local consumers.	In all agroecological scenarios food and feed biomass availability cover EU-wide demand.
	The implementation of agroecological practices can result in lower crop and grassland yields per hectare.	Reduced production levels would lead to higher prices for many goods.
SDG 4 - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Agroecology fosters cooperation, that enhances learning opportunities for farmers and other actors.	Experiences with life-long learning and the coverage of sustainable farming in school curricula have the potential to stimulate changes in consumer behaviour and diets.
SDG12 - Ensure sustainable consumption and production patterns	Transition from mineral to organic fertilisation may generate trade-offs between yields and biodiversity benefits and/or carbon footprint.	Agroecological scenarios would imply a small reduction in economic welfare for consumers and producers.
	Reduction in the use of external inputs and improvement in the quality and use-efficiency of inputs.	Without reductions in demand and food waste large-scale implementation of agro- ecological practices has the risk of shifting environmental pressures outside the EU.
	Reduction of the economic sustainability of the farming system in the short term.	Stronger integration of crop and grass production with reduced livestock production contributes to remaining within current agricultural land endowment in the EU.
SDG13 - Take urgent action to combat climate change and its impacts	Agroecological practices can decrease GHG emissions on a farm and result in lower GHG footprints per hectare. Examples are lower pesticide use and inter-row green cover.	An increase in land under agroecological practices would lead to a consistent reduction of GHG emissions.
	The uptake of single agroecological practice can result in increases in GHG emissions, for example through increased fuel use for mechanical weeding.	Potential for climate change mitigation can be realised with agroforestry and the related carbon sequestration in woody biomass.
SDG15 - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Combinations of agroecological practices (e.g., farm and crop diversification, cover crops, intercropping with nitrogen fixing crops, no tillage etc.) ensure a more sustainable management of natural resources.	Reducing grazing intensities on high natural value farmland is possible without the risk of shortages in grass supply for domestic ruminant livestock.
		Freeing up agricultural areas through an overall reduction in the size of the food system would increase the protection of habitats and the establishment of habitat corridors.

Source: Authors' own elaboration based on Albanito *et al.* (2021) and Röös *et al.* (2021).

of intensive livestock, often heavily dependent on compound feed, so that the number of calories provided for human consumption remained unchanged. The main improvements to environmental goods and services relate to reduced use of external inputs, and more efficient use of natural resources.

From a social perspective, the local adoption of agroecological strategies involves different types of cooperation actions that imply sharing information, and developing joint investments in research and education. The outcome is the provision of learning opportunities for farmers and other categories of actors (public authorities, value chains, NGOs, consumers).

Evidence from analysis of transitions to agroecological farming systems in case studies shows that the introduction of agroecological practices could reduce the economic sustainability of these farming systems in the short term. This is a typical economic barrier to transition, overcoming which requires the creation of added value and the design of effective policy support for systems that are economically viable in the long-term (Gava *et al.*, this issue). However, over the longer term, case study findings suggest higher profitability for farms using agroecological systems (e.g. organic) due to premia paid by consumers and shorter supply chains (Landert *et al.*, 2020), supporting findings of other studies (e.g. Hatt *et al.*, 2016).

The set of scenarios used in the territorial modelling were analysed for their potential for regional food self-sufficiency informed by biophysical (e.g. land use, food production), environmental (e.g. greenhouse gas emissions) and social indicators, the outcomes of which were debated by stakeholders at EU and local levels (Röös *et al.*, 2022). The main results led to two contrasting storylines for upscaling agroecological practices: i) agroecology implemented to produce high-value products serving high-income consumers through trade, with 40 per cent of agricultural areas under organic production but no change in diets, leading to limited improvements in environmental indicators compared with the status quo; ii) sustainable intensification in combination with dietary change and waste reduction met targets relating to climate, biodiversity, ammonia emissions, and use of antibiotics, but no reductions in pesticide and fertiliser use.

Overall, many of the social and environmental benefits can be realised if agricultural systems adopt wide-ranging innovations, from the plot to the food systems level. However, the total size of domestic food systems is central to avoid a shift of environmental pressure to regions beyond the EU. Amongst positive outcomes expressed in the storylines are the potential for climate change mitigation through practices such as agroforestry, combined with increased habitat protection, mainly as a result of the reduction in the size of the food system. Potential negative implications relate to the economic welfare for consumers and producers which could decrease in relation to some commodities and increase in relation to others, with a small reduction in economic welfare overall.

Evidence from the agroecological scenarios shows that the current level of livestock production should be reduced to remain within the current agricultural land endowment in the EU in the future. The introduction of innovative livestock diets and new production methods could help to rebalance nutrient supply and demand at the sub-national scale. This would imply structural changes to the livestock sector, which should become better linked to potential agricultural land uses within the EU.

Human diets play a crucial role in tackling the depletion of natural resources by agriculture, since they determine the total size of the food

Agricultural landscape in the Chianti region, UNISECO case study in Italy © Roberto Stucchi

system. Findings from the modelling highlight a need for significant changes in dietary patterns and reductions in food wastes for large-scale diffusion of agroecological practices to become a feasible trajectory (Mayer *et al.*, this issue).

A range of policies and actions are required from other food system actors, including initiatives that go beyond agricultural production to include processing and retail and that develop the demand side. This is a key insight since a paradigm shift is taking place within the EU to change the focus from solely food production towards securing ecosystem services and maintaining cultural landscapes, as set out in the EU Farm-to-Fork Strategy.

Key factors contributing to the sustainability of transitions to agroecology

The transdisciplinary perspectives brought to bear in the consultations and analysis within case studies led to the identification of key market and policy instruments, and of actions required to facilitate and enable transitions (Figure 1). In particular, they informed understanding of barriers to the development of the demand side with knowledge of consumer demand; regulatory, processing and retail product standards; and the farming systems of producers (Méndez *et al.*, 2013).

In a series of workshops, stakeholders reviewed evidence from the case studies and territorial modelling, and identified key factors which they considered to be essential for facilitating agroecological transitions, notably relating to human and social capital, and the role of the public sector, as summarised below.

Strengthening human capital is key for overcoming barriers to transitions to agroecology, and taking advantage of certain types of drivers (Figure 1), such as new support measures or land management strategies (e.g. intercropping, direct drilling). Knowledge is required of the benefits of such agroecological practices and the associated potential economic, environmental and social opportunities (Miller *et al.*, this issue). Such human capital is key to the design of land management practices that can maximise synergies (e.g. high biodiversity performance combined with lower GHG emissions, Spanish case study) and minimise trade-offs (e.g. higher GHG emissions due to energy intensive irrigation, Greek case study) (Landert *et al.*, 2020).

The development and strengthening of social capital can be significant in encouraging the uptake of agroecological land management practices, and increasing the negotiating power within value chains of producers to secure premiums for agroecological products and greater acceptance by retailers of variability in produce. Such power can be gained from strengthened collaborative actions and collective institutions (Gava *et al.*, this issue).

Agricultural landscape in the county Nienburg, Lower Saxony, UNISECO case study in Germany © Johannes Carolus

Examples of collaborative actions identified in the stakeholder workshops are the creation of collective post-harvest models for small farms to carry out joint processing, purchase of equipment and machinery, and mechanisms for sales.

Collaborative actions can be aided significantly by intermediaries. Such intermediaries may be mutually trusted advisors, bringing actors together from potentially competing perspectives (e.g. philosophical positions on production types; retail based on evidence of preferences of majority of consumers), or creating new networks of communities of interest or place. They may take a lead in creating new structures of governance or reconfiguring old ones with an aim of delivering public goods (e.g. through social innovations; Ravazzoli *et al.*, 2021). However, improving social capital is a long-term process that requires an enabling policy environment which provides support for capacity building, and for investments to institutionalise new forms of cooperation (Zawalińska *et al.*, this issue).

Another key factor is the importance of changes in consumer behaviour and diets. The identification of key market and policy instruments (Figure 1) in the transition strategies co-constructed with actors in the value chains included an opportunity to promote changes in diets through consumer awareness campaigns and public procurement programmes in schools and canteens. The EU Directives on procurement provide legal frameworks for achieving socially responsible public procurement through social and environmental clauses (European Commission, 2021).

The identification of opportunities by stakeholders corroborates examples of clauses being applied in public procurement agreements regarding the inclusion of organic food (e.g. exemplars in European Commission, 2021, of Fair trade food for Munich's schools, Germany, and Reserved tender for food processing in Vendée, France). This approach would help overcome barriers such as market saturation of organic products. It is an example of the important role that the public sector can play in creating conditions conducive to agroecological transitions by encouraging long-term stability of market demand; and also delivering on SDG Target 12.7 of promoting public procurement practices that are sustainable, in accordance with national policies and priorities. Public sector interventions can also be used to tackle problems of overconsumption and food waste in food chains with their implications for public health, social justice and food security; and delivering on SDG Target 12.5 of substantially reducing waste generation through prevention, reduction, recycling and reuse.

Members of the Multi-Actor Platform in Lithuania investigating solutions to address barriers to transitions to agroecology © Baltic Environmental Forum Lithuania

Combined, these key findings point to the need for a wider food system perspective in transitions to agroecology and supporting policies (Gliessman, 2016). In particular, changes in the production and consumption of animal products were recognised as major factors that impact on the feasibility of transition pathways. Such changes would contribute to delivering on SDG Target 12.1 of implementing a 10-Year Framework of Programs on sustainable consumption and production. More sustainable human diets, which contain fewer animal products could enable large-scale implementation of agroecological practices without over-pressurising domestic agricultural land and avoiding deforestation (Mayer *et al.*, this issue).

Emerging research needs

The multi-level transdisciplinary approach with the direct involvement of representatives from policy and public agencies (with responsibilities at regional, national or European levels), businesses (from micro to multi-national), environmental NGOs (local to international), civil society and research brought together actors with different perspectives on how the sustainability of farming systems can be strengthened. The organisation of these actors into EU and local groupings enabled participants to identify the sustainability implications of transitions to agroecology that need to be addressed in future research.

In particular, they identified gaps in knowledge in relation to long-term socio-economic implications of agroecological transitions, an example of which is the need for greater understanding of what is required for achieving a 'just transition' to agroecology. This concept is emerging in international policy discourses, as in the recent EU strategy on 'A long-term Vision for the EU's Rural Areas', which highlights the 'need for ensuring rights and responsibilities of all actors in just transitions to farming systems'. It is also increasingly relevant in the debate regarding food system transformation based on agroecology principles (Anderson *et al.*, 2019).

A further research gap identified was in understanding the roles of individual and community marginalisation and inequality occurring at EU level during the development and adoption of agroecological strategies, and on the design and development of sustainable food systems. Studies of marginalisation and inequality should include those citizens who want opportunities to be farmers, which is reflected in wider challenges of generational renewal in agriculture (Coopmans *et al.*, 2020). Findings in related EU research projects (e.g. H2020 NEFERTITI, H2020 NEWBIE) show the benefits of new entrants to farming through their introduction of new knowledge and ideas. However, greater attention should be paid to relationships between generational renewal and transitions to agroecology to understand the attitudes, values and behaviours of young farmers in relation to agroecological approaches and principles.

Findings from the analysis and interpretation of territorial modelling with stakeholders, identified the need to understand the effects of the adopted agroecological strategies and practices within the EU and beyond; so that global trade flows do not reapportion environmental damage to other countries, or support inadequate standards of human rights, while taking the credit for green policies at home (Fuchs, Brown and Rounsevell, 2020; Röös *et al.*, 2022). As in other sectors of the economy, corrective policies should be put in place to restrict significant negative spill-overs. As transitions to agroecology progress, direct and indirect experiences of actions can be expected to influence those yet to undertake change, leading to positive and negative spillovers (Yang *et al.*, 2021). Policy options such as those which are incentive, penalty, or voluntary based need to be informed by evidence to minimise environmental impacts at different geographic or functional levels; whilst also respecting equalities in opportunities to exercise pro-environment behaviours by organisations and businesses (Craig *et al.*, 2019) and individuals within supply chains. Combining modelling tools such as BioBAM and SolM with qualitative and quantitative studies of behaviours of actors at each stage in supply chains, from producers to consumers, could offer new insights into factors that influence multiple, linked or dependent, behaviours.

The proposed Horizon Europe Partnerships on 'Accelerating farming systems transition: Agroecology living labs and research infrastructures' and 'Safe and Sustainable Food Systems' offer the prospect of addressing some of these research needs.

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Summary

Exploring Sustainability Implications of Transitions to Agroecology: a Transdisciplinary Perspective

Successful transitions to agroecology require shared understanding of the sustainability implications of transitions for food systems. To gain such understanding, a transdisciplinary approach is increasingly called for by funders, end users of research and scientists. Transdisciplinary processes were used in the UNISECO project to develop strategic pathways that enable transitions to agroecology in case studies across Europe. These strategic pathways were combined with scenarios of EU food systems in 2050, in which combinations of agroecological farming and food consumption practices were assessed. These were then reviewed considering selected UN Sustainable Development Goals (SDGs) as a reference for discussing the sustainability implications of transitions to agroecology. Sustainability implications were identified for several SDGs including Zero Hunger (SDG 2), Quality Education (SDG 4), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13) and Life on Land (SDG 15). Key factors contributing to the sustainability of transitions to agroecology are: i) mature social capital and improved farmer knowledge of the benefits of agroecological practices; ii) strengthened collaborative actions and collective institutions to increase negotiating power within the value-chain; and, iii) changes in consumer behaviour and diets. These factors highlight the need for a food system perspective in transitions to agroecology and supporting policies. This in turn highlights the meaningful role of transdisciplinary research in strengthening the sustainability of European food systems.

Explorer les implications des transitions vers l'agroécologie pour la durabilité : une perspective transdisciplinaire

Les transitions réussies vers l'agroécologie nécessitent une compréhension partagée des implications des transitions en termes de durabilité pour les systèmes alimentaires. Pour parvenir à une telle compréhension, une approche transdisciplinaire est de plus en plus demandée par les bailleurs de fonds, les utilisateurs finaux de la recherche et les scientifiques. Des processus transdisciplinaires ont été utilisés dans le projet UNISECO pour développer des voies stratégiques qui permettent des transitions vers l'agroécologie dans des études de cas à travers l'Europe. Ces voies stratégiques ont été combinées avec des scénarios sur des systèmes alimentaires de l'Union européenne en 2050, dans lesquels des combinaisons d'agriculture agroécologique et de pratiques de consommation alimentaire ont été évaluées. Les résultats ont ensuite été examinés en tenant compte de certains objectifs de développement durable (ODD) des Nations Unies comme référence pour examiner les implications en termes de durabilité des transitions vers l'agroécologie. De telles implications ont été identifiées pour plusieurs ODD, notamment Faim zéro (ODD 2), Éducation de qualité (ODD 4), Consommation et production responsables (ODD 12), Action pour le climat (ODD 13) et Vie terrestre (ODD 15). Les principaux facteurs contribuant à la durabilité des transitions vers l'agroécologie sont: i) un capital social mature et une meilleure connaissance par les agriculteurs des avantages des pratiques agroécologiques; ii) des actions collaboratives et des institutions collectives renforcées pour accroître le pouvoir de négociation au sein de la chaîne de valeur; et, iii) des changements dans le comportement des consommateurs et les régimes alimentaires. Ces facteurs soulignent la nécessité d'une perspective de système alimentaire dans les transitions vers l'agroécologie et les politiques d'accompagnement. Cela met ainsi en évidence le rôle significatif de la recherche transdisciplinaire dans le renforcement de la durabilité des systèmes alimentaires européens.

Auswirkungen des Agrarökologischen Wandels auf die Nachhaltigkeit: eine transdisziplinäre Sichtweise

Ein erfolgreicher Übergang zur Agrarökologie erfordert ein gemeinsames Verständnis über die Auswirkungen auf die Nachhaltigkeit von Lebensmittelsystemen. Um ein solches Verständnis zu erlangen, wird von Geldgebenden, der Forschung und ihren Endnutzern und -nutzerinnenzunehmend ein transdisziplinärer Ansatz gefordert. Im Rahmen des UNISECO-Projekts wurden transdisziplinäre Prozesse eingesetzt, um strategische Pfade zu entwickeln. Sie sollen den Übergang zur Agrarökologie in Fallstudien in ganz Europa ermöglichen. Diese strategischen Pfade wurden mit Szenarien der EU-Lebensmittelsysteme im Jahr 2050 zusammengeführt und in Kombination mit agrarökologischen Landwirtschafts- und Ernährungsgewohnheiten bewertet. Als Referenz für die Diskussion der Auswirkungen auf die Nachhaltigkeit dienten ausgewählte UN-Ziele für nachhaltige Entwicklung (Sustainable Development Goals, SDGs). Die Auswirkungen wurden für mehrere SDGs identifiziert, darunter *Kein Hunger* (SDG 2), *chancengerechte und hochwertige Bildung* (SDG 4), *nachhaltiger Konsum und Produktion* (SDG 12), *Klimaschutz und Anpassung* (SDG 13) und *Leben an Land* (SDG 15). Schlüsselfaktoren, die zur Nachhaltigkeit des Übergangs zur Agrarökologie beitragen, sind: i) gewachsenes Sozialkapital und verbessertes Wissen in der Landwirtschaft über die Vorteile agrarökologischer Verfahren; ii) verstärkte gemeinschaftliche Aktionen und kollektive Institutionen, um die Verhandlungsmacht innerhalb der Wertschöpfungskette zu erhöhen; und iii) Veränderungen im Konsumverhalten und in der Ernährung. Diese Faktoren unterstreichen die Notwendigkeit, Übergänge zur Agrarökologie und unterstützende Maßnahmen aus der Perspektive der Lebensmittelsysteme zu betrachten. Hieraus wird wiederum die bedeutende Rolle einer transdisziplinären Forschung zur Stärkung der Nachhaltigkeit europäischer Lebensmittelsysteme deutlich.