

## POSITION PAPER

# The BIOEAST vision of agroecology

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## 1 The decade of agroecological transition in the EU's agricultural policy

Creating more sustainable agricultural production systems drives the current European discussions on the new Common Agricultural Policy (CAP) and the new research and innovation framework programme, Horizon Europe 2021–27 (EC HE, 2019). The agriculture and food sector is traditionally one of the major fields that shape policies in the European Union (EU) as it generates approximately 44 million jobs, including 20 million people employed by the agricultural sector alone (Eurostat, 2018). The CAP alone constituted 37.2% of the whole EU expenditure, while the societal challenge 'Food security, sustainable agriculture and forestry, marine maritime and inland water research and the bioeconomy' of the Horizon 2020 research framework programme allocated around 40% of its total budget to agricultural research projects (EU REG, 2013; EC HE, 2015, 2017, 2020). Societal demand for these considerable funds to be utilised for transforming the current primary production and the entire food supply chain into a more sustainable system is stronger than ever.

To this end, the EU has become the frontrunner in setting ambitious objectives to achieve the United Nations' Sustainable Development Goals (SDGs) by 2030 and comply with the Paris Agreement via integrating economic, environmental and social sustainability measures into its policy. In December 2019, the European Commission adopted the European Green Deal, committing itself to zero net carbon emissions

by 2050 and tackling environmental challenges in relation to agriculture, specifically mentioning the transformation of agriculture to climate-friendly, sustainable practices such as organic agriculture, agroecology, and agroforestry through its Farm to Fork Strategy (EC COM, 2019) and the new CAP. This ambition is also reflected in the Horizon Europe 2021–27 research and innovation framework programme, in which 'Cluster 6: Food, Bioeconomy, Natural Resources, Agriculture and Environment' (EC HE, 2019) prioritises the challenges, which current agricultural practices face, and puts the emphasis on more environmental-focused research targets that help the transition of agriculture toward sustainable production and food systems. The planned European Partnership on Agroecology, for which a preparatory call titled 'Accelerating farming systems' transition: agro-ecology living labs and research infrastructures' was already launched in 2019, explicitly addresses the importance of the agroecological approach and its multi-actor realisation (EC HE, 2019).

Assuming that necessary funding will be dedicated to the EU's ambitious objectives, it seems that the concept of agroecology and its means of implementation will have a central role within the new CAP and Horizon Europe to boost the regional implementation and upscaling of place-based solutions for sustainable production systems all over Europe. But how do we define and implement such an agroecological transition? The current paper aims to describe the position of the authors, who co-coordinate the Agroecology and Sustainable Yields Thematic Working Group of the BIOEAST<sup>2</sup>

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<sup>2</sup> BIOEAST stands for the Central-Eastern European Initiative for Knowledge-based Agriculture, Aquaculture, and Forestry in the Bioeconomy.

Initiative in collaboration with the Hungarian Ministry of Agriculture. The BIOEAST comprises 11 Central Eastern European (CEE) countries (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia) with the aim to define their common vision and strategic research and innovation agenda on agroecology.

## 2 The rise of the concept of agroecology – and how BIOEAST countries interpret it

Agroecology is not a new concept, even though it gained momentum in European policy only recently. The term ‘agroecology’ emerged in the late 1920s and was used to describe a scientific discipline that aimed to understand the ecological interlinkages between the different natural elements of an agricultural landscape (Altieri, 1999). Primarily, agroecology investigated the alternatives to chemical pesticides, such as biological pest management, or how to decrease the use of mineral fertilisers by understanding soil biology, while it also evaluated the economic impact of certain practices (Wezel et al., 2009; Altieri, 1999; Hatt et al., 2016). It is important to emphasise that agroecology as a science has been interdisciplinary right from the beginning, encompassing social and economic aspects beside natural sciences since it placed traditional agriculture practiced by smallholders and family farms at the centre of its investigations (Holt-Giménez and Altieri, 2013).

Agroecology started to outgrow its scientific borders from the 1980s onwards, when it evolved into a social (and later also a political) movement fostering a set of agroecological practices. As a movement, agroecology broadened its scope from the farm level and started to thematise social and economic aspects that address the inequalities in agriculture and the whole food system (food sovereignty, peasants’ rights, access to genetic resources, the role of women in agriculture, etc.), involving a wide range of stakeholders in the value chain from farmers to consumers (Wezel et al., 2009; Gliessmann, 2018). Therefore, agroecology today incorporates the entire food system with all of its participants, integrating the above mentioned broad socio-economic dimensions, sustainable agricultural practices, and production systems that aim to reduce the impact of agriculture on the environment, such as organic farming, conservation agriculture, permaculture, etc. (Altieri, 1999; Wezel et al., 2009; Hatt et al., 2016; Gliessmann, 2018).

Due to its broad scope, local-specific and multi-stakeholder nature, agroecology has many definitions. Global intergovernmental organisations, such as the Food and Agriculture Organization of the United Nations (FAO, 2018) or the High-Level Panel of Experts on Food Security and Nutrition (HLPE, 2019), regard agroecology as a tool to achieve the SDGs. The social movement side of agroecology represented by Agroecology Europe, has also formulated its own definition, which is based on the principles set by FAO and HLPE (see website Agroecology Europe, 2020).

Although the international concepts of agroecology are very broad and diverse and there is also no official definition at the EU level, agroecology as a term is being used more and more frequently in the European agricultural policy debate.

It is mainly regarded as a promising approach comprising sustainable farming practices where ecosystem services are maintained and sustainably managed to maximise crop growth and animal welfare through appropriate resource management. As such, “agroecology most recently has become an umbrella concept of European agricultural and food policy which aims to trigger the transition to a more sustainable agri-food system” (EC COM, 2019; EC HE, 2019). In line with this interpretation, the CEE countries realised the need to translate the notion of agroecology to their specific economic, environmental, and social contexts in order to make sure that future European policies on agroecology are fit for purpose in this macro-region.

The BIOEAST countries emphasise their joint commitment in achieving the EU’s aspiration toward more sustainable agriculture, and aim to formulate a joint strategic research and innovation agenda (SRIA) for working towards sustainable, knowledge-based agriculture, aquaculture, and forestry in the CEE macro-region by 2021. The BIOEAST SRIA, including its agroecology chapter, is also meant to provide recommendations for the European Commission on the BIOEAST countries’ research needs that may be taken into account when designing the new Horizon Europe work programme.

Taking into account that in the Central Eastern European countries national policies traditionally strongly focus on achieving economic growth and closing up to Western European economic status, and that this may happen to the detriment of sustainability measures, it is evident that the BIOEAST SRIA needs to overcome the currently practiced subjugation of agriculture to short-term economic benefits and societal trade-offs. The SRIA needs to set a new vision on “agroecology as a sustainable growth model”, specific to the unique economic, social, environmental, and cultural challenges and characteristics of the CEE macro-region. It thus needs to address the increasing socio-economic and environmental externalities that are deeply rooted in the current agricultural treadmill (Crews et al., 2018). In the following, we describe where the BIOEAST vision on agroecology currently stands in the ongoing process of its co-creation.

## 3 What is specific about the CEE region?

Agroecology represents a promising approach not just because it can develop sustainable practices for agriculture but also aims to manage complex global problems on the local level, therefore finding different solutions to a given problem based on regional characteristics. Regarding environmental challenges, the negative impacts that resource and chemical-intensive agriculture<sup>3</sup> poses on the environment and human health (soil depletion and erosion, surface and groundwater contamination by nitrate leaching, biodiversity loss, high levels of greenhouse gas emissions, water scarcity,

<sup>3</sup> Of all farms in the EU (10.5 million in total), only 2.9% (dominantly large-scale enterprises) accounted for the majority (55.6%) of the EU’s total agricultural economic output, whereas small-scale farms account for 67.6% of all farms in the EU. Large farms use approximately 52% of all agricultural land in the EU. Operating a large farm often results in the decline of agricultural diversity and the rise of input-intensive practices (Eurostat, 2016).

etc.) (IPCC, 2019; IAASTD, 2009) in the CEE region are similar to other parts of Europe. To face these challenges, the CEE countries, as all other countries of Europe, need to safeguard their natural resources and ecosystem-services by transforming their agricultural production systems to more sustainable practices. However, in order to successfully achieve this, the CEE countries must address the specific challenges they face from an agricultural economics and socio-cultural perspective. These challenges are very much different from those of the EU-15<sup>4</sup> countries, and overcoming them requires specific efforts. In the following, we provide an insight into the most important differences.

The primary production sector is the motor of Europe's bioeconomy. Agriculture and the food industry provide approximately 63 % of the EU's total employment (agriculture 19%, food sector 44%), which constitutes 76 % of the total turnover of the EU's bioeconomy (agriculture 54%, food sector 22%) (JRC, 2018). The analysis of the relationship between employment and turnover only for the CEE countries, where agriculture is historically an important economic sector, shows that these countries account for about 48 % of the EU's employment in agriculture, but their share of the European agricultural turnover is only 16 % (NOVA, 2018). This disproportion is mostly related to three tendencies observed in the CEE countries:

1) The comparatively low agricultural productivity in the region, which is 39.6 % of the EU average (BIOEAST, 2018). This is most apparent in the so-called yield gap in cereal production between the EU-15 and CEE countries. EU-15 produce an average of 6.5 t/ha, while the average cereal yield in the CEE region is 5.2 t/ha (ECSTAT, 2019). Although it may very well be so that the 6.5 t/ha yield in EU-15 is too high, given that this production is only possible by using practices that are unsustainable in the long run. Currently a plateauing or declining in wheat yields in the EU-15 is observed and there is interest to keep this level whilst introducing more sustainable practices (Ray et al., 2012). On the other hand Salmon et al. (2017) claim that yields in the CEE region are projected to increase significantly (15 to 50 %) by 2026, especially those of cereals. An economic growth opportunity that CEE countries are keen not to miss, however, needs to be carefully analysed and addressed so that environmental and social dimensions of agriculture are not suppressed for the sake of economic growth.

2) The labour productivity in agriculture is 20 % lower in the CEE region than the EU average, which can be traced back to lower technological, infrastructural, and organisational development of the region (Eurostat, 2019). At the same time, this might also mean that CEE countries use less herbicides and heavy machinery and have a less uniform agricultural landscape than the EU-15, which is beneficial to ecosystem services such as pollination and pest control. Lower application rates of fertilisers (mineral as well as manure) allow lower levels of surface water eutrophication and better-

conserved marine zones, etc. However, here again, we are confronted with setting EU-15 as an economic role model, while acknowledging the need for alternative solutions to avoid negative environmental externalities.

3) The difference between EU-15 and CEE countries is also apparent in the below-average gross hourly earnings in the agricultural sector of the CEE countries: 3 to 6 EUR/hour in the CEE compared to the 16 EUR/hour EU average (ICEPS, 2013). These figures should be normalised using the overall level of earning between countries or analysed in more detail by looking at the earnings within different sectors of agriculture in both regions. However, even without a more detailed comparison, the broad figures themselves indicate why agriculture in the CEE has such a disproportionately low share in the EU agricultural turnover and thus, from a solely economic perspective, relatively low importance.

Overall, we concur with Horváth et al. (2019) that although the EU-15 countries have reached a high technological development and efficiency in agriculture resulting in high productivity, at the same time, the environmental resources have become highly depleted due to unsustainable practices in these countries. While productivity in the CEE region is lower than the EU average mainly due to (on average) less intensive production practices and poor sectoral organisation, the region is more abundant in natural resources, such as natural habitats and biodiversity. However, even though the negative impacts of over-intensive agriculture are widely known, the economic status of EU-15 remains a role model for the CEE countries, and politically there is a keen interest to close up to the EU-15 productivity level.

Therefore, the following question emerges: is it possible to increase the productivity of agriculture in the CEE region while phasing out the unsustainable use of natural resources? Should BIOEAST set the closure of the yield gap as a target of the agroecological transition? Since the concept and practical solutions of organic agriculture are very much in line with those of agroecology, the International Federation of Organic Agriculture Movements (IFOAM) highlights organic agriculture as a model of agroecological farming (IFOAM, 2019). Organic agriculture shows positive results in terms of some environmental and social metrics such as increased local agrobiodiversity, better livelihood for farmers, higher employment of farmers, or better cooperation among farmers (Reganold and Wachter, 2016). However, it is important to point out that its yield performance compared to conventional practices varies within a wide range (high differences between cereal or horticultural crops) and its overall productivity is highly context-dependent (Seufert and Ramankutty, 2017). We also know that the more intensive an agricultural system is, the exponentially more input resources are needed to achieve the same amount of productivity growth than in case of less intensive production systems (Tittonell et al., 2016). In view of such results, it seems challenging to develop new, truly agroecological practices that are able to produce even higher yields than our current input-based, intensive production systems while not compromising environmental and social sustainability. However, high hopes are put into artificial intelligence-based decision-making systems and

<sup>4</sup> EU-15 stands for the 15 "old" member states of the European Union: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

precision agriculture techniques that may become new tools for answering this challenge (Bilali and Allahyari, 2018).

Whether a technology-focused agroecological approach lives up to current “sustainable intensification” expectations or not, the agroecological transition needs to apply new, environmentally friendly production methods that have the potential to stabilise yields also under adverse climatic conditions while maintaining or increasing farmer income, e.g. through innovative policy measures that favour the agricultural production of public goods.

Reaching the EU average wages in CEE agriculture will be a prominent issue in the coming years that also relates to the long-term development of rural communities since rural areas are more densely populated in the CEE region than in EU-15, and agriculture in rural areas generates 25 % of all jobs in the CEE region (BIOEAST, 2018). More importantly, the adaptive capacity and preparedness of rural communities to climate change is low, yet according to projections climate change will hit the CEE region disproportionately hard (EEA, 2019). Key challenges of agriculture related to climate change appear in form of extreme hot periods, uneven distribution and amount of precipitation, water shortages such as decrease of surface and ground water levels and reduction of soil moisture. Regardless of climate change, there is a need for technical and management improvement. To mention one example, as the exposure of soils to compaction is higher in the CEE region, agricultural productivity, which is already low, can rapidly decline (Lavalle et al., 2009; EEA, 2019).

Also, adaptive capacity can be increased through applied research and innovation. This activity has, however, been rather modest in the CEE area. According to Pokrivcak et al. (2019), this can be attributed to the differences in farm structure between the CEE countries and EU-15, such as the lower number of technology-intensive farms, and the low cooperation between producers of the CEE region. This may have resulted in a comparative disadvantage for the CEE countries to apply for research and innovation funds as they could not benefit from funds that are intrinsically tailored to larger, technology-ready operations. However, this argument needs to be further supported by a more detailed analysis of farm structure specificities among the CEE countries as their characteristics are far from homogeneous within the macro-region (see Guiomar et al., 2018).

Considering the region-specific economic and socio-cultural challenges of agriculture shared in the CEE countries, setting joint research priorities for an agroecological transition is even more important to ensure tailor-made solutions instead of general measures that may in fact prove counter-productive for the region.

#### 4 Applying the CEE vision of agroecology

The CEE vision of agroecology is aimed to reach high levels of technological, knowledge, research, and innovation outputs by transforming the region’s agriculture and food system using the full potential of sustainable practices based on agroecological principles. To achieve this vision, the CEE countries of the BIOEAST initiative are ready to establish and

operate a network of agroecological living laboratories (or living labs) as an effective tool to realise this focus (BIOEAST TOR, 2019). The expression ‘living laboratory’ defines open innovation systems or environments that directly integrate all stakeholders of a given value chain in the development process to find solution to a specific problem (Feurstein et al., 2008). By translating the concept of living labs to the agricultural and food sector, the CEE countries aim to support the creation of living labs that can tackle the complex economic, environmental, and social challenges related to the agriculture and food sectors of the region by finding innovative, local-specific, and practical solutions through agroecological approaches.

The network of living labs, collecting and sharing good practices in order to encourage agricultural innovations and agroecological transition is also foreseen in the Partnership on Agroecology within Horizon Europe 2021-27. As a preparation for the Partnership, the following steps have been determined by the BIOEAST countries:

1. To study and synthesise existing national agricultural research and innovation strategies and collect good agroecological policy examples from the macro-region.
2. To set up a network of relevant stakeholders (embracing small and medium enterprises, large companies, farmers, advisors, researchers, consumers, public and civil society organisations) of the BIOEAST countries to collect and discuss practical experiences with agroecological transition pathways.
3. To stimulate discourse on agroecological sector development in the CEE region in light of the diverging visions on fostering competitiveness through closing the yield gap vs achieving sustainable income with enhancing yield resilience.
4. To implement policy pilots and seek financing resources in the CEE region and the EU for creating an enabling environment for agroecological living laboratories and for testing place-based agroecological innovations.
5. To contribute to the programming of the national Strategic Plans of the Common Agricultural Policy in order to guarantee policy consistency throughout the macro-region.

Moreover, the BIOEAST thematic working group on Agroecology and Sustainable Yields is represented by its coordinators in the Horizon 2020 preparatory action Strengthening the European agro-ecological research and innovation ecosystem, which aims to develop the framework for a European network of agroecological living labs and research infrastructures (EC, 2019). Within this keystone project of the EU’s agroecological transition, we coordinate stakeholder engagement and the creation of a pilot network of agroecological living labs, where this approach may be tested and developed further under real-life conditions.

#### 5 Conclusion

This position paper is aimed to present the diverging interpretations of agroecology within the international agricultural and food policy debate with a special focus on the EU and



the Central Eastern European countries. More importantly, the paper emphasises the relevance of creating a joint vision on agroecology and a Strategic Research and Innovation Agenda specific to the unique economic, environmental, and social aspects in the CEE region. However, this vision needs a broad political willingness to be implemented in practice across the macro-region, which raises several questions mainly concerning the future economic output of CEE agriculture and the financial support allocated or available to the BIOEAST SRIA objectives. Still, the vision of agroecology in the BIOEAST countries points out that for the CEE region agroecology represents an opportunity to create innovative, regional solutions for an environmentally but also economically and socially sustainable agricultural system. However, this can be achieved only if the fragmentation of agricultural policies is avoided and a system-based approach, which is based on strong socio-economic arguments, is implemented.

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