

Central-Eastern European Agriculture and the Transition to Bioeconomy

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The transition from a mineral dependent economy to one in which biogenic resources form the basis of bio-based products and production processes relies both on scientific innovative knowledge and on the capacity of agricultural, aquacultural, and forestry ecosystems to deliver biomass for food and non-food uses. Agricultural policy is expected to play a critical role in facilitating such a transition, being one of the few highly harmonized EU policies, with a substantial budget and a strong experience base. Within the EU, the question often raised is twofold: to what extent the Common Agricultural Policy (CAP) shapes alternative pathways to sustainable bioeconomy transition, and conversely how bioeconomy development is paving the way for new potential areas for reform of the CAP and related research challenges. This also brings in the topic of coordination between the CAP and the EU bioeconomy strategy.

The demand of biomass for non-food uses further intensifies agricultural activity. The need to reduce land footprints strengthens the call for smart and innovative approaches, beyond the traditional ways of producing and consuming biomass, and therefore beyond traditional land use patterns. Targeting sustainable bioeconomy development is the object of a multi-policy landscape. In this landscape, policy coherence is a key topic; its achievement is attempted through strategic documents encompassing the main relevant policy areas and authorities. Built on the original strategic guidelines and experience acquired since 2012, the updated European Bioeconomy Strategy (European Commission [EC], 2018) advocates the deployment of circular and sustainable supply chains. Integral to this is the adoption of the cascading principle, defined as using biomass as an input first, then recovering its energy content at its end-of life, and promoting the development of biorefin-

eries that focus on high value products and organic waste re-use.

On the demand side, understanding markets for bio-based products is a challenging area for agricultural economics, one that requires multidisciplinary studies. In addition to technical progress that relaxes the constraints of relative resource scarcity, the institutional arrangements necessary for regulating innovation and allocating intellectual property rights draw attention to societal coordination and governance of all involved agents. Additional issues concern logistics and spatial considerations, due to the low value-high weight of biomass, as well as supply chain organization, which is strongly influenced by changing technologies for biomass processing and bio-product design. All the above issues drive the expansion of agricultural economics research, so that the concept and deployment of the bioeconomy add value to economic analysis and policy design.

The above issues are discussed in this special issue where six articles address three main topics: the definition of bioeconomy, consumer perceptions, and economic and environmental sustainability policy drivers. These articles provide insights on the nature and the evolution of the bioeconomy and the perceptions of scientists and consumers. Special emphasis is given to Central and Eastern European agriculture, where the growth of the bioeconomy is receiving increasing attention.

Definition of Bioeconomy

Konstantinis et al. observe differences in bioeconomy strategies among the European Union, the United States, and China, and also examine the peculiarities of EU member states' national strategies. These strategies identify different visions of the bioeconomy, with the life sciences approach, which encompasses biotechnol-

ogy and resource efficiency, being the dominant narrative that supports the enhancement of productivity through global value chain development. Nevertheless, alternative visions exist, primarily the agroecology perspective that advocates shorter supply chains; in some cases it is antagonistic and in others complementary to the life science approach. This paper investigates relevant published research in order to construct bibliometric networks of the global scientific literature that document these perspectives and shape a visual definition of the evolving bioeconomy. Interactions between economic activities and research outcomes are examined, leading to conclusions regarding the primary causes of the appearance of bioeconomy as a buzzword, its current form, and future perspectives. It is obvious that there is no static definition of bioeconomy, but it is rather a dynamic term. Thus there is a clear worth in using the means of bibliometric analysis to provide a critical understanding of its evolution.

Maciejak attempts to assess to what extent the strategy designed and implemented for bioeconomy development in the European Union addresses the societal expectations for holistically perceived quality, delivered not only by explicit product characteristics but also by economic processes as societal and environmental services. He argues that bioeconomy related actions so far fail to address sustainability. However, being supported by the Common Agricultural Policy, they can be shifted in such a direction. The policy framework for agricultural development has shown already a drift from quality resulting from solely economic expectations towards quality that addresses economic, societal, and environmental requirements. On the other hand, bioeconomy objectives to deliver high quality food and non-food biomass is paving the way for new challenges in agricultural policy to ensure the coexistence of different production systems.

Consumer Perceptions towards Biological and Novel Products

Tsimitri et al. observe that advances in bioeconomy lead to exploitation of food waste for the production of high added-value goods. However, these products often face consumer resistance, due to a phenomenon known as “neophobia.” The objective of this study was to investigate consumer acceptance or rejection of a novel food product and to classify consumers according to their “neophobia tendency.” A functional yogurt derived from halloumi whey was chosen as a hypothetical scenario. Halloumi is a tasty Protected Designation of Ori-

gin cheese that makes up approximately 15% of Cypriot total domestic exports. Data were collected through a survey in typical urban areas. Statistical analysis revealed three types of “neophobia tendency” in each sample. Regarding the acceptability of the novel yogurt, consumers are driven by their curiosity, while the main factor in rejection is the absence of health claims.

Sustainable Bioeconomy and Agricultural Policy

In 2012 the European Commission adopted a strategic document underlining the need for bioeconomy development and requiring the implementation of sustainable agriculture. In view of the above, the need for defining the direction for development of farm businesses arises, whether it will be a sustainable pathway or rather one of standard industrial agricultural production. Research conducted by *Wrzaszcz* on the basis of Polish public statistics from 2005, 2007, and 2016 indicated progress towards sustainable farming. Data analysis pointed out that there is still a need to support farms in order to stimulate their environmental organization and implementation of desirable agricultural practices.

The aim of the research undertaken by *Bareith et al.* is to explore the spatial pattern of the demand by Hungarian farms for agroforestry aids and identify its environmental and socio-economic drivers. More specifically, they investigate (i) the spatial cluster structure of Hungarian settlements based on the potential for agroforestry and (ii) whether these clusters differ significantly in their tendency to engage in agroforestry or other agri-environmental projects. The revealed cluster structure and characteristics may help develop strategies to improve the efficient implementation of agroforestry earmarked budget items in the context of agri-environmental CAP measures. For this purpose, they recommend identifying target areas where agroforestry adoption cannot be supported spontaneously by agglomeration effects and therefore need to be supported by education and innovation networks.

Cultivation of abandoned land can moderate the effects of indirect land use change induced by increased food and non-food demand by bio-based sectors. Spatial analysis estimated that unutilized or abandoned land in Poland amounts to about one million ha countrywide. *Rozakis and Borek* assess the suitability of SRC willow plantations in representative classes of soil on abandoned land compared to cereal cropping, specifically triticale. Taking into account uncertainty in prices, yields, maturation period, and seedling survival rate, as

well as contractual arrangements for willow biomass, stochastic budgeting provides evidence that willow plantations are preferred by risk-averse farmers for parcel sizes higher than two ha. Projection at the country level indicates that perennial plantations may reach approximately 20% of abandoned arable area, or 80,000 hectares. This figure is lower than previous estimations, since it refers to the economic instead of the theoretical or the agronomic potential of specific parcels. Further analysis taking into account management schemes, demand, and spatial allocation of parcels is necessary to determine the business potential, which will determine the volume of bio-based activity exploiting perennial willow plantations.

Discussion and Further Research

The exponentially increasing scientific corpus on the economics of bioeconomy, as shown by *Konstantinis et al.*, is systematically presented in several recent books emphasizing sustainability (Viaggi, 2018), transition (Lewandowski, 2017), supply chain efficiency (Panoutsou, 2017), the role of bioenergy (Lago, Caldés, & Lechón, 2018), and technology transfer in the agro-industrial sector (Kalaitzandonakes, Carayannis, Grigorioudis, & Rozakis, 2018). The papers included in this special issue aspire to enrich the potential variety of issues and pathways for economic research on the bioeconomy in Europe. Among the features to be highlighted, two points appear as especially relevant. One is the link between economic and ecosystemic features of territories, which requires techno-economic analyses to

actually understand the real potential of biomass and hence bioeconomy development, while keeping in mind technology development and changing organizational options. The second feature concerns the link between values and perceptions of consumers and citizens, which inform markets and shape opportunities but, in turn, can be affected by information. Policy studies are needed throughout due to the high relevance of agricultural policies, the public goods features of the bioeconomy, the innovation component, and the fact that many bioeconomy products require the creation of new markets.

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