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Collaborative Complexity on Bioeconomy Path

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Abstract

In the last decade, the term bioeconomy has gained importance in research debates. The place of the Amfiteatru Economic journal among the Web of Science publications addressing the field of bioeconomics is promising. The Bucharest University of Economic Studies is among the universities with representation in the field of bioeconomy. To promote a competitive and sustainable bioeconomy, there is a need for a participatory engagement between the public and stakeholders in open and informed dialogue, as well as governments and industries receptive to innovation. It was also found that the main theme of the red cluster from the bibliometric analysis undertaken in the field of bioeconomy is “innovation”. For this, a 38-year cycle was studied which showed 1,054 articles identified that used the term bioeconomy. Bioeconomics is part of our daily lives, so publications display the multitude of terms and multidisciplinary life-supportive connections. Biological resources and innovative technologies are already being used to replace unsustainable products and processes, which are currently obtained from fossil resources. Some biobased goods may even have new properties, which make them superior to current known and used products. The results of the research can be useful for the regulations on climate change and environmental sustainability along with economic and social development; it is unanimously accepted that an activity, even commercial, contributes to the social support of the population and its health. Research and innovation promise solutions to the challenges of business and society. To reduce the gap between current potential and the moment when concrete applications begin to generate societal impact, critical efforts will be essential to make progress visible.

Keywords: bioeconomy, research, bibliometric analysis, collaboration.

JEL Classification: A30-39, N500, O300, Q000

1. Introduction

To prevent the harmful accumulations of life and to mitigate the existing ones, humanity needs ideas, concepts and legalities for the efficiency and clarification of

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the planetary environment. Thus, the terms that coagulate, globally, the social, economic and environmental are “innovation”, “science”, “biorafinery” and “forest” and represent the result of the bibliometric study on bioeconomy which includes works of scientific research published between 1975 and February 2019.

Extensive studies have shown that only the bioeconomy has the duty to highlight laws that reconstitute the biological primacy over typical human voluntarism. It is worth to note the contribution of the Romanian researcher Georgescu-Roegen who conceived and used the term bioeconomy to refer to a radical ecological perspective on the economy which he developed in the 1970s and 1980s.

In response to many questions, the research undertaken by Şerban M. (2013) culminated with the fundamental law of bioeconomy. According to the author, bioeconomy expresses the assurance of an optimal quantity of the living environment of humanity. Based on such considerations and through long observations, Vivien F-D. et al. (2019) found that bioeconomy has become a key word used by public institutions to announce and describe an alleged current economic and ecological transition.

Therefore, it is necessary that through appropriate mechanisms the natural basis of the planet and the climate system be preserved. Noteworthy is the European Commission's effort to stimulate Europe's transition to a circular economy, fuelled by global competitiveness, raising awareness, and promoting the concept of sustainability and last but not least, generating new jobs.

The reference to the innovative economy – “a bioeconomy for Europe” - is suggested by the European Commission, following the projections regarding the alarming growth of the population at global level. Specifically, the essential aspects refer to: development of technologies and processes for bioeconomy; developing markets and competitiveness in bioeconomy sectors; closer collaboration between decision makers and stakeholders. As a result, through the natural supports, economy is “timing” the race between the critical points of nature and politics while European Union, promoting the initiatives in bioeconomy, creates financial opportunities, respectively European structural investment funds.

2. Problem Statement

The European Commission laid the foundation for the new EU strategy on climate change through the European Green Agreement. In this context, the bioeconomy can respond to the challenge by managing sustainably resources and processing waste for commercial purpose.

Bioeconomy, as a field of current scientific research, achieves values of intelligence (knowledge and innovation development), sustainability (based on a greener, competitive economy and efficient in resource management) and also proves favourable to inclusion (aims to strengthen employment, social and territorial cohesion).

Bioeconomy is defined as the economy that produces and processes biological resources from terrestrial and aquatic ecosystems / agroecosystems. As a result, it

includes agriculture, forestry, fishing, aquaculture, food industry, cellulose and paper industry, but also important part of chemical, biotechnological and energy industries, an in-depth situation of the EC bioeconomy.

The bioeconomy and natural economies have common elements with the economies based on fossil fuel consumption. Like the natural economy, the bioeconomy is based on renewable (bio) resources. From another point of view, production is more intense as in the fossil fuel economy, but inputs are sustainably produced and are effectively rebuilt, reused, or recycled (Potting et al. 2017).

From a physical point of view, the bioeconomy can be measured by biomass flows, determined by fundamental economic concepts (demand and supply).

Demand is driven by society's need for food, feed, bioenergy and biomaterials (natural fibres, biochemicals and pharmaceuticals) (Kitchen and Marsden 2011).

Lewandowski (2015) considers that the supply of biomass is made from agricultural and non-agricultural land, respectively: (a) pastures provide pasture for animals; (b) agricultural land supplies cereals and crop residues; (c) forests, plantations and many small farms provide woody biomass for energy and for use as a building material; (d) lakes and rivers provide aquatic biomass.

The analysis of the existing scientific literature on bioeconomy takes a global approach and includes all fields of research (there is a significant overlap in research conducted on bioeconomy between the fields of human, social, natural and technical research; for example, the ethical aspects of bioeconomy development are often covered by journals classified as humanists, so the research field is included). Figure 1 shows the research areas in tangency with bioeconomy with a participation of at least 4% of the total works displayed by Web of Science. The works are presented mostly in English (Figure 2).

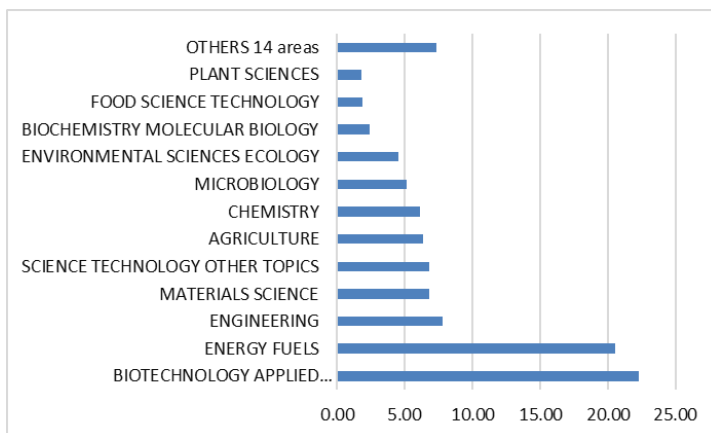


Figure 1. Research areas with bioeconomy application

Source: Personal quantitative processing of data downloaded from the Web of Science

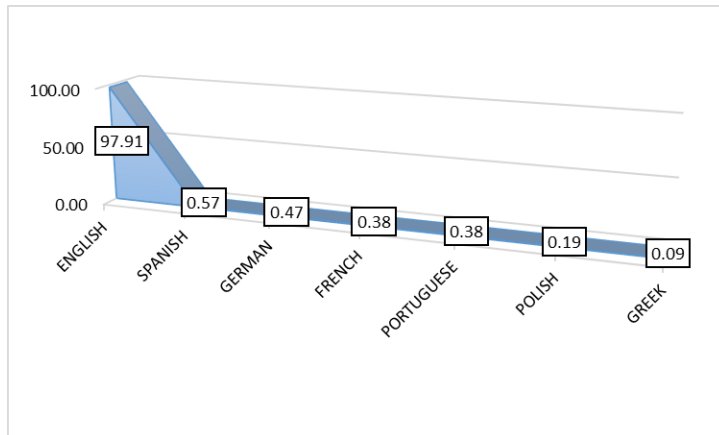


Figure 2. Linguistic representation of works (%)

Source: Personal quantitative processing of data downloaded from the Web of Science

This research is associated with didactic activities of universities. For this reason, it is important to know the representativeness considering publishing of universities in the bioeconomic field (Figure 3). It is found that the Bucharest University of Economic Studies ranges in the first half of all universities.

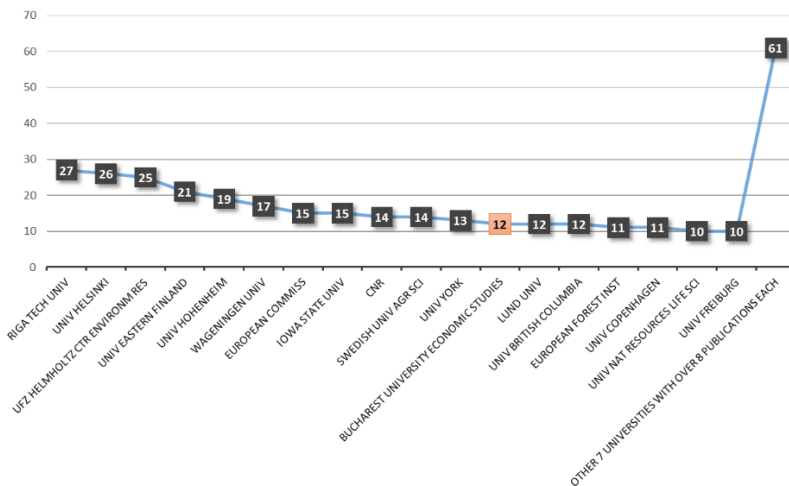
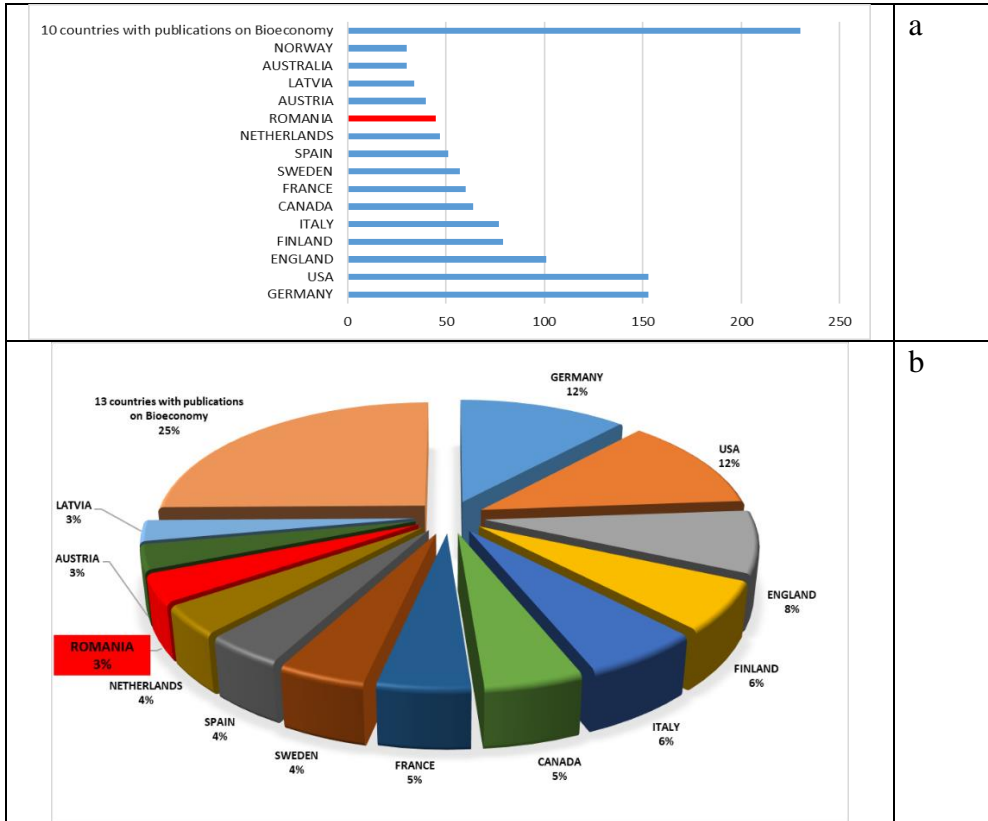


Figure 3. University representativeness for research in bioeconomy (number)

Source: Personal quantitative processing of data downloaded from the Web of Science

Universities operate in cities scattered throughout the world. Figure 4 shows in number and structure the scientific records from different countries. Romania is in the first half of the list of countries with advertising registrations (3%), but their number is below the average of country registrations.



**Figure 4. Countries affiliated to scientific publications in the field:
a – number of records; b – structure of records**

Source: Personal quantitative processing of data downloaded from the Web of Science

The results of the scientific endeavour are published in internationally recognized journals - ISI: Journal of Cleaner Production, Sustainability, Biofuels Bioproducts, Biorefining Biofpr, New Biotechnology, Amfiteatru Economic, Energy of Proceedings, Chemical Society, Bioresource Technology, Biotechnology for Biofuels, New Genetics and Society, Economic Complexity and Evolution, International Sugar Journal, Knowledge Driven Developments in the Bioeconomy Technological and Economic Perspective, Technology and Technology, Forests, Journal of Biotechnology, Current Opinion in Environmental Sustainability, Trends in Biotechnology, Applied Microbiology and Biotechnology, Biosocieties, Forestry Chronicle, International Scientific Conference Environmental. These include Amfiteatru Economic journal, with a 5% share in the bioeconomic theme (Figure 5). The journal is the product of the Romanian teachers, researchers and scientists mainly from the Bucharest University of Economic Studies.

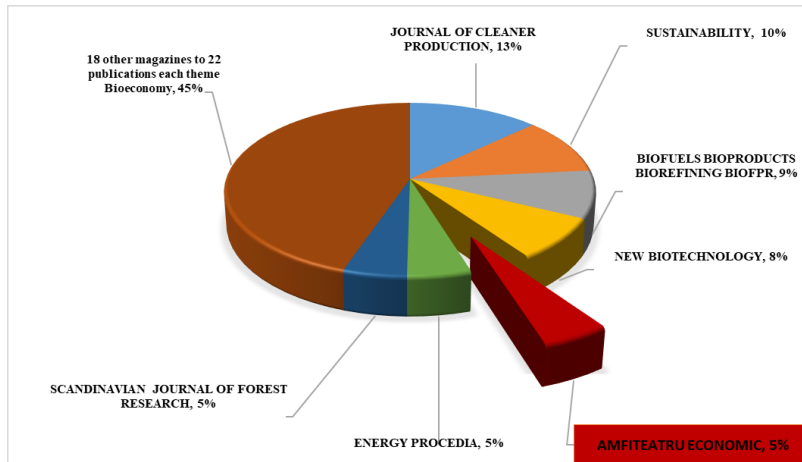


Figure 5. Publications that show scientific articles on bioeconomy theme

Source: Personal quantitative processing of data downloaded from the Web of Science

3. Research Questions / Aims of the Research

Sustainability is currently the most important issue in human existence. The constant growth of human population and the consumption per capita have contributed to the diversification of anthropogenic activities, involving natural resources that are close to depletion and accelerating the accumulation of waste. At the same time, urbanization, industrialization and modern agricultural practices have polluted the water, air and soil resources, making it difficult for future generations to survive. To stop these consequences, multidisciplinary bioeconomic research (methodological harmonization and coherence in the value chains of the bioeconomy) proposes sustainable solutions for policy development.

The quantitative approach of research through specialized literature in the field highlights the importance of the current bioeconomic models, as well as the socio-economic interconnection relations with the environment in the perspective of sustainability.

4. Research Methods

Bibliometric approach of bioeconomy foundation. Bibliometric analysis is based on the literary retrieval of the relevant scientific articles indexed in a recognized scientific database (Web of Science). The delimitation of a sample can be defined by the period of publication chosen, the geographical location of the authors, the selection of research areas, the selection of a journal sample or the selection of keywords (Diaconeasa et al., 2019; Zaharia et al., 2019). For the purpose of this study, the indexed literature analysed is that between the beginning of 1975 and the beginning of 2019 (February).

The literature review identifies the paths of bioeconomy. It refers to the links of bioeconomy with biotechnology (it stresses the importance of biotechnological research and the application and commercialization of biotechnology in different sectors of the economy), natural resources (it focuses on processing and modernizing biological raw materials, as well as creating new value chains) and ecology (it highlights the sustainability and ecological processes that optimize the use of energy and nutrients, while promoting biodiversity and avoiding monoculture and soil degradation). Bioeconomy includes production systems that involve biophysical and biochemical processes. Including all life sciences and related technologies that result in useful products, the collaborative aspect of the research, but not only, is shown. At the same time, the effects of climate change and the depletion of fossil resources have increased the pace of interdisciplinary research in the field of bioeconomy; noting the need to use bioresources responsibly by reducing / reusing / recycling / recovering, the bioeconomy finds its usefulness.

The quantitative approach of the research through the scholarly literature in the field highlights the importance of the current bioeconomic models, as well as the socio-economic interconnection relations with the environment in the perspective of sustainability. Using the Microsoft Office Excel program and VOSviewer software, an analysis of the content of the scientific publications from Web of Science platform including the term bioeconomy was made by quantitative and qualitative approach, respectively the main issues discussed in the titles and abstracts.

The terminology and definitions for bioeconomy accessed in the bibliometric analysis come in particular from the European Commission, the OECD (Organization for Economic Co-operation and Development), the United States of America, as well as the International Energy Agency for Bioenergy (IEA Bioenergy) and the European Association for Bioindustry (EuropaBio).

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