Bioeconomy in Romania - Aim for an Innovative Economy?

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Abstract
In the world, population growth phenomenon is accentuated, being estimated an increase of 30% over the next 40 years, leading to more than 9 billion people by the year 2050. In this period, mankind will face a exploitation without preceding of its natural resources, them being finite. There will be significant climate change, loss of biodiversity, increasing pressures on the environment, threatening, thus, the stability of living systems. In this context, Europe needs to change the manner of approaching to production, consumption, processing, storage, recycling and disposal of biological resources. Bioeconomy is the key element for smart growth in Europe, aspect pointed out in the Europe 2020 strategy adopted by the European Commission. This strategy is based on the Seventh Framework Program for Research and Technological Development (FP7) and the EU Framework Program for Research and Innovation (Horizon 2020). Bio-economy represents a cost savings in using the soil and sea biological resources, including the production of renewable biological resources and conversion of those resources and waste to value-added products (food, feed, bio bioenergy). Bioeconomy include sectors like agriculture, forestry, fisheries, food industry, as well as parts of chemical industry biotechnological and energetic. Bioeconomy relies on life sciences, agronomy, ecology, food science, social sciences, biotechnology, information and communication technologies and engineering. The bioeconomy support granted in the European Union offers many opportunities for Romania. Through bioeconomy specific approaches, the bioresources production potential in Romania could be exploited. Developing and implementing new solutions for better exploitation of this Romanian potential requires a significant investment in education and research. For Romania, the bioeconomy is a chance, an objective for a more innovative economy, smart, low emissions and with more sustainable use of renewable resources.

Keywords: bio-economy, innovation, resources, renewable, research

1. Introduction

In the world, there is a pronounced population growth phenomenon, with an estimated increase of 30% in the next 40 years, reaching over 9 billion people by 2050. Also, unprecedented natural resource exploitation is occurring in Europe, with significant and possibly irreversible climate change, and a continuing decline in biodiversity. All this threatens the stability of living systems. To overcome these challenges, research and innovation are needed to make rapid and sustainable changes in lifestyle and in the use of natural resources.

Lately, the European Union has introduced or revised a series of policies to address the new challenges and transformation of the European economy. Also, solving some multidimensional issues that will emerge requires a extensive strategic approach involving different policies. To support coherence between policies will require a well-founded interaction from informational point of view.

The Europe 2020 strategy is based on the Seventh Framework Program for Research and Technological Development (FP7) and the EU Framework Program for Research and Innovation

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(Horizon 2020). The Europe 2020 strategy makes bio-economy a key element for smart, green growth in Europe. Establishment bioeconomy in Europe has the advantages:
- the ability to maintain and generate growth and jobs in rural, coastal and industrial areas;
- reduce dependence on fossil fuels;
- to increase the economic and ecological sustainability of primary production and manufacturing industries [1].

Bioeconomy is an economy that uses biological resources from the soil and sea, including the production of renewable biological resources, as well as the conversion of these resources and waste into value-added products (food, feed, bioproducts and bioenergy). Bioeconomics encompasses agriculture, forestry, fisheries, food industry, and parts of the chemical, biotechnology and energy industries. Bioeconomics is based on life sciences, agronomy, ecology, food science, social sciences, biotechnology, information and communication technologies and engineering. Bioeconomy can also be defined as the science of the dynamic integration of mankind into the environment. The fundamental element of bioeconomy is industriosphere, defined as the specialized system created by mankind for achieving dynamic integration into the environment. The fundamental law of bioeconomy can be formulated as follows: ensuring a high quality of the living environment of humanity. The living environment of humanity comprises: the sum of the elements of the natural environment with which man can come into contact, as well as the sum of the elements that make up the social environment [2].

The increase in world population by 2050, according to estimations, will lead to a 70% increase in food demand and a doubling of world meat consumption. The bio-economy strategy will help define a global approach to this challenge by developing a knowledge base on the sustainable growth of primary production. The strategy will also encourage changes in production and consumption patterns, as well as the development of healthier and more sustainable food regimes.

Agriculture, forestry, fisheries and aquaculture need some essential and limited resources to produce biomass. Their use also implies significant opportunity costs related to the depletion or loss of ecosystem services. The bioeconomy strategy aims to improve the knowledge base and encourage innovation to achieve productivity gains. At the same time, both the sustainable use of resources and the reduction of environmental pressure are ensured. The bioeconomy strategy will support a global approach to more sustainable use of resources. This will include promoting international common understanding of the concept of sustainability of biomass and establish best practices to open new markets, diversify production and solve the problems of long-term food security.

The European economy relies heavily on fossil resources as carbon and energy sources, making it vulnerable in conditions of insecurity and reduced supply as well as market volatility. The bio-economy strategy will include the results on bio-products, the pilot market initiative and will support the Blue Growth initiative [4]. The strategy will also support the objectives of the Renewable Energy Directive and the Fuel Quality Directive as well as the Strategic Energy Technology Plan by improving the knowledge base and encouraging innovation to produce quality biomass at a competitive price. These will be achieved without compromising food security, without increasing pressure on primary production and the environment, and without distorting markets in favor of energy use.

The bio-economy strategy supports the development of low-emission greenhouse gas production systems tailored to the adverse effects of climate change, such as drought and floods, and mitigating these effects. The strategy will also promote, wherever possible, the replacement of carbon, energy and water intensive production processes, with more resource-efficient and environmentally friendly processes.

The EU's bio-economic sectors have an annual turnover of 2 000 billion EUR and represent more than 22 million jobs, or about 9% of the workforce. Sustainable primary production, biotechnologies in the food and industrial and biorefineries sectors are expected to generate significant growth. All this will lead to new bio-industries, turning the existing ones, and opening new markets for organic products [3]. Thus, new highly qualified jobs and new training options must be created to meet the demand for labor in these industries as well as agriculture, forestry, fish farming and aquaculture.

It is estimated that funding for direct research related to the bio-economy strategy in the context

of the Horizon 2020 Framework Program could generate about 130000 jobs and an added value of EUR 45 billion in the bio-economic sectors by 2025 [5]. In all these sectors, additional growth should be generated by other public and private direct and indirect investments. Bio sector is expected to contribute significantly to achieving the Europe 2020 objectives.

Bioeconomy offers an opportunity to address to the challenges of society, such as: ensuring food security, sustainable management of natural resources, reducing dependence on non-renewable resources, mitigating and adapting to climate change, and creating jobs and maintaining European competitiveness.

2. Materials and methods

Europe 2020 focuses on two major initiatives: "A Union of Innovation" and "An efficient Europe in terms of resource use." Bioeconomy will help achieve the goals of the two initiatives. The Bio-Economy Strategy and its Action Plan aim to facilitate the way towards a more innovative, resource-efficient, more competitive society while ensuring the protection of the environment. The impact of bioeconomy research and innovation in order to be maximized required specific actions, such as: a coherent policy framework; increasing investment in knowledge, innovation and skills; participatory governance and better communication with the public; developing biofuel markets by developing new infrastructures and tools. This paper addresses the theoretical aspects of the Europe 2020 Strategy in the field of bioeconomy as well as the related Action Plan, by analyzing the documents that highlight the theme, innovation for sustainable growth.

3. Results and discussion

The Bioeconomy Action Plan describes the main actions for achieving the objectives of the bio-economy strategy, which are actions related to: investing in research, innovation and skills; increasing interaction between policies and stakeholder involvement; market development and increased competitiveness in the bio-economy.

Among the actions in the field of investment in research, innovation and skills, we mention:

- Ensure substantial funding, from EU and national sources, as well as investment and private partnerships for bioeconomy research and innovation. Presenting the main concepts and priorities for research and innovation in the field of food, sustainable agriculture and forestry and maritime and maritime activities in the context of the Horizon 2020 Framework Program.
- Increasing the share of multidisciplinary and cross-sectoral research and innovation to address the complexities and interconnections of societal challenges by improving the existing knowledge base and developing new technologies.
- Promoting assimilation and dissemination of innovations in the bio-economic sectors and creating further feedback mechanisms for regulations and policy measures, as appropriate. Expanding support for knowledge networks and advice and support services for businesses, in particular through the European Innovation Partnerships and Bioclusters.
- Creating the human resources needed to support the growth and further integration of the bio-economic sectors by organizing university forums for the development of new curricula and training programs in the field of bioeconomy.

As for the actions on increasing the interaction between policy and stakeholder involvement, we find:

- Create a group for Bioeconomy (Bioeconomy Panel) which will contribute to improving synergies and increased coherence between policies, initiatives and economic sectors related to the bioeconomy at EU level and its correlation with existing mechanisms. Organize regular Bioeconomy Stakeholder Conferences.
- Establish a Bioeconomic Observatory in close cooperation with existing information systems allowing the Commission to regularly assess the progress and impact of the bio-economy and to develop tools for future prospection and modeling.
- Support the development of regional and national strategies in the bioeconomy by reviewing existing research and innovation activities, competence centers and infrastructures in the EU.
- Develop international cooperation on research and innovation in the field of bio-economy with the aim of jointly addressing global challenges such as food security, climate change and the issue of sustainable biomass supply.

Market development and increased

competitiveness in the field of bio-economy would be achieved by:
- Provide the knowledge base needed for the sustainable enhancement of primary production. Promoting in all sectors a better understanding of the availability and current, potential and future demand for biomass, taking into account the added value, sustainability, soil fertility and climate change mitigation potential.
- Promote the establishment of networks with the necessary logistics for integrated and diversified biorefinery and for demonstration installations and pilot plants across Europe, including the logistics and supply chains necessary for the cascade use of biomass and waste streams.
- Supporting the expansion of new markets by developing standards and standardized methods for assessing sustainability for organic products and for food production systems; contributing to the long-term competitiveness of the bio-economic sectors by establishing incentives and mutual learning mechanisms for more resource-efficient use.
- Developing scientific approaches to informing consumers about product properties and promoting a healthy and sustainable lifestyle.

Significant support for bio-economy at EU level offers a number of opportunities for Romania as well. In Romania, the importance of the development of bioeconomy and related research is provided in structural strategies at national level as well as in the National Strategy for Research, Development and Innovation 2014-2020. The Competitiveness Operational Program (POC) 2014-2020 also includes bio-economy among the areas of intelligent specialization. The national public funding of the research-development-innovation activity destined for the bio-economy is based on National Strategies and Action Plans, the one in Romania being finalized at the Ministry of Agriculture and Rural Development and at the Ministry of National Economy. Private funding is also provided through institutional and public-private partnerships, which define their own long-term strategic innovation and research agendas.

Romania has a significant bio-economic potential both in the production and processing of renewable resources, but the infrastructure is not sufficiently developed and there is a significant shortage of skilled labor, thus limiting the valorization of the bio-economic potential in our country. For the development of this sector action would be needed to support the creation of new start-ups in the field as well as intensive growth by improving the exploitation methods and increasing productivity, as well as ensuring financing from national, public and private sources.

A good thing is that the Department of Agriculture and Rural Development of the European Commission will receive useful information on bioeconomy through the new Bioeconomic Information Center launched on 20 July 2017. This new information center will facilitate evidence-based actions on agriculture and rural development in this sector, providing comprehensive knowledge of bio-economy, including data, information and expertise.

4. Conclusions

Until 2050, mankind will face unprecedented exploitation of its natural resources and, as they are finite, Europe has to change its approach to the production, consumption, processing, storage, recycling and disposal of biological resources. Significant climate change will occur, biodiversity decline, increasing of environmental pressures, threatening the stability of living systems. Against this background, bio-economy is a key element for smart growth in Europe, as also outlined in the Europe 2020 Strategy adopted by the European Commission. For Romania, as in the other cases, bio-economy is a chance, it offers a number of opportunities and it is a goal towards a more innovative, smart, low-carbon economy, as well as a more sustainable use of renewable resources.

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