

The role and impact of university research on the bioeconomy in Romania

Chapter 5

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This chapter will begin with an overview of global bioeconomy trends and realities, examining existing strategies with a focus on bioeconomy policies. From the global scale, we will then look at the European Union level and the particularities of different member states. The situation in Romania (where currently the bioeconomy is mainly regarded as part of adopted EU strategies) is introduced with a summary of the contributions from agriculture and life science research and further in-depth findings on shifting research trends and contributions to all research activities. In terms of both general research and bioeconomy-related research, the academic environment and universities are the major stakeholders. Developing on recent trends and access to the EU's Innovating for Sustainable Growth bioeconomy strategy as EU policy (Research & Innovation – H2020) underlines not only the major local players (among which universities make up a majority) as well as their assets: knowledge, experience and existing networks. More importantly, this framework is completed by shifts in strategic development orientations of universities and academic research centres, which is an indication of the priority given to bioeconomy research, particularly in the case of agriculture and life sciences and related scientific establishments. Examples are given to underline the most up-to-date orientations and developments in extending the national character of the strategies/policies by moving up to a transregional scale clustering competences and resources for regional and global bioeconomy topics. Secondary data from national and EU statistics, reports and analyses, and project implementation reports supports the examples.

The global overview as summarised in Table 5.1 ranks the EU among the G7 members in terms of relatively weak support and a lack of funding transparency with regard to common strategies and/or policies. EU members are fairly consistent in their approaches. Those who lack strategies also lack key stakeholders (as in the case of Italy) while others are more thorough in their distribution of tasks and support, strategic programming and authorities (as in the case of Germany, which even has a dedicated federal council).

Table 5.1. Overview on bioeconomy policy in the G7, including the EU.

Member	Strategy name	Key stakeholders	Key funding areas
Canada	Growing Forward	Ministry of Agriculture	R&D on renewable resources and biobased materials, bioenergy
EU	Innovating for Sustainable Growth	DG Science, Research, Innovation	Research & innovation (Horizon 2020) public-private partnerships
France	Bundle of bioeconomy-based policies	Ministry for Ecology, Ministry for Research	Bioenergy, green chemicals, clusters, circular economy
Germany	1. Bioeconomy Research Strategy 2. Bioeconomy Policy Strategy	1. Ministry for Research 2. Ministry for Agriculture	R&D on food security, sustainable agriculture, healthy nutrition, industrial processes, bioenergy
Great Britain	Bundle of bioeconomy-based policies	Parliament, Departments: Energy & Climate, Environment, Transport,	Bioenergy, agricultural science and agro-technology

		Business	
Italy	No specific bioeconomy policy	-	Participation in EU programmes
Japan	Biomass use and industrial strategies	Cabinet, National Biomass Policy Council	Research & innovation, circular economy, regional development
United States	1. Bioeconomy Blueprint 2. Farm Bill	1. White House 2. USDA	1. Life sciences (biomedicine) 2. Agriculture (multiple areas)

Source: “Bioeconomy Policy (Part I): Synopsis and Analysis of Strategies in the G7. A report from the German Bioeconomy Council”, Berlin, January 2015

Table 5.2 highlights the national/regional perspectives and the associated strategies, policy papers or programme documents along with the adoption year or programming period. It should be noted that fewer than half of the EU member states are listed in the table based on the inclusion criteria of final and adopted bioeconomy strategies/policies or bioeconomy programme documents. This is because some of the countries and/or regions not included in Table 5.2 may have been at different stages of preparing strategic documents at the time the report was issued in January 2015. Lithuania is a very positive surprise, having adopted a national programme from the very beginning of the country’s second programming exercise as an EU member state.

Table 5.2. Bioeconomy perspectives and policy/strategy documents in the EU.

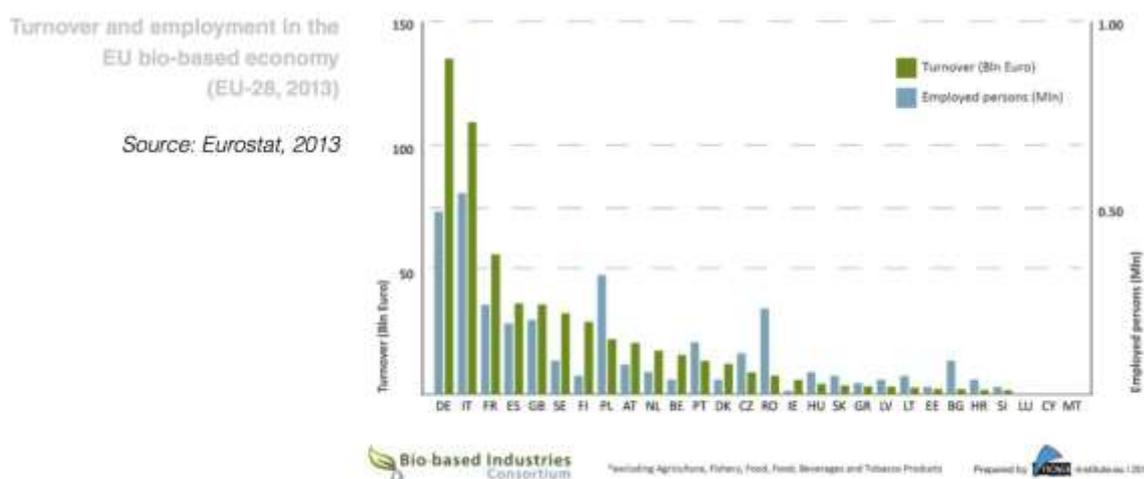
Country	Perspective	Document name
Austria	Research & innovation	Research, Technology and Innovation Strategy for Biobased Industries in Austria (2014) Policy Paper on Bioeconomy (2013)
Belgium	Regional bioeconomy development	Bioeconomy in Flanders (2014) and Action Plan
Denmark	Green economy	Growth Plan for Water, Bio and Environmental Solutions (2013) Growth Plan for Food (2013)
Finland	Holistic bioeconomy development	The Finish Bioeconomy Strategy (2014)
Ireland	Blue economy Green economy Research & innovation	Harnessing Our Ocean Wealth (2012) Delivering Our Green Potential (2012) Towards 2030 (2008)
Lithuania	High-tech	National Industrial Biotechnology Development Programme (2007-2010)
Netherlands	Green economy Biobased economy	Groene Groei: voor een sterke, duurzame economie (2013) Groene Groei - Van Biomassa naar Business (2012) Framework memorandum on the Biobased Economy (2012) Green Deal Program (2011)
Norway	Research & innovation High-tech	Research Programme on Sustainable Innovation in Food and Biobased Industries (2012-2022) National Strategy for Biotechnology (2011) Marine Bioprospecting – a Source of New and Sustainable Wealth Growth (2009)
Portugal	Blue economy	Estrategia Nacional para o Mar (2013-2020)
Sweden	Research & innovation	Swedish Research and Innovation Strategy for a Bio-based Economy (2012)
West Nordic Countries (Iceland, Greenland, Faroe)	Holistic bioeconomy development	Future Opportunities for Bioeconomy in the West Nordic Countries (2014)

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Source: Bioeconomy Policy (Part I): Synopsis and Analysis of Strategies in the G7. A report from the German Bioeconomy Council, Berlin, January 2015.

The turnover and employment in the EU biobased economy, published by the public-private partnership Bio-based Industries Consortium (BIC) in their 2015 annual report (Fig. 5.1), offers a sharper perspective. Western European economies with a considerable high-tech advance such as Germany, Italy, France, Spain, Great Britain, Sweden and Finland have consistently more turnover compared to employment, while Central and Eastern Europe ‘cohesion economies’ in new member states report almost systematically higher employment compared to turnover, notably in Poland, Romania and Bulgaria.

Figure 5.1. Turnover and employment in the EU biobased economy.



Source: Bio-based Industries Consortium (BIC), Annual Report 2015, based on Eurostat data, 2013

Table 5.3 shows current estimates of bioeconomy opportunities and outlooks for Romania as outlined in the national/regional research and innovation strategy for smart specialisation (RIS3). According to these figures, more than one third (35.59%) of the active population works in bioeconomy-related fields and generates over one fifth (21.61%) of country’s GDP. These high employment and return rates are further completed with forecasts highlighted in Romania’s national Energy Strategy, with the country’s potential second-generation bioethanol production (from residues, by-products and secondary agricultural production) estimated to be 200,000 TOE/year. This production takes into account only 17.5% of maize, wheat and sugar beet secondary production as non-food agricultural resources. The impact of second-generation bioethanol production is estimated to also be significant in terms of:

- Rural employment, with a minimum contribution of 3,200 jobs/year
- Physical bioethanol production, at 200,000 TOE
- Turnover of €1.1 billion
- Potential greenhouse gases reduction of 1.6 billion mtCO₂e

Table 5.3. Bioeconomy estimates in Romania.

	% GDP	% active population
Agriculture, forestry and fishery	5.62	29.1

Industrial processing of biobased resources	7.91	3.23
Food industry	5.38	2.1
Cellulose and paper	1.67	0.82
Energy from bioresources	0.72	0.28
Green chemistry	0.14	0.03
Biomedical bioeconomy	0.12	0.02
Biopharmaceuticals	0.05	0.01

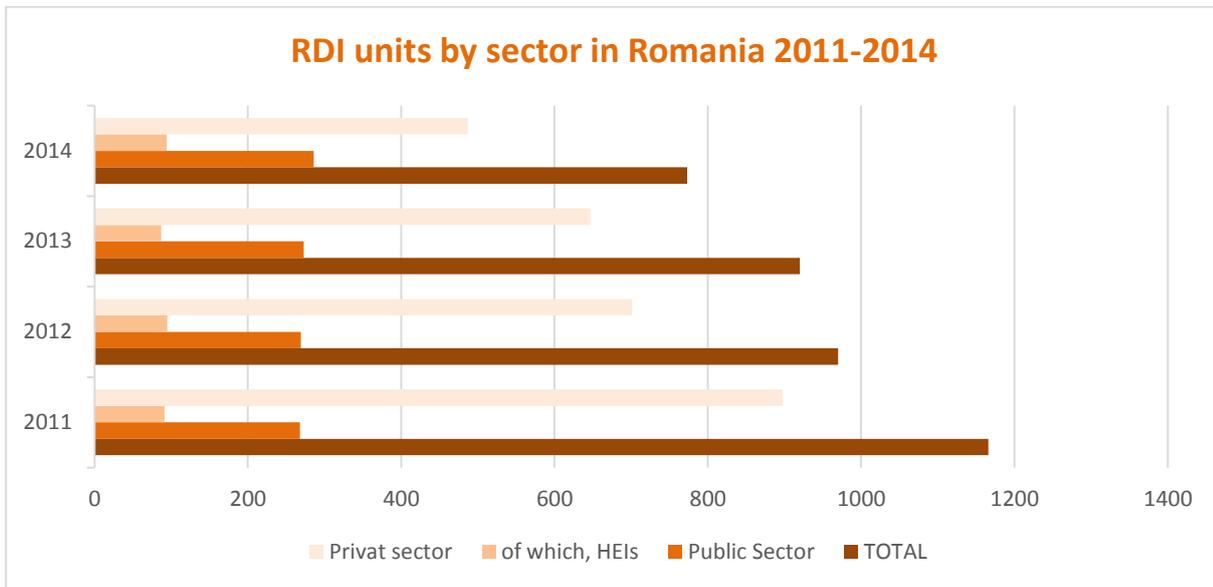
Source: Bioeconomy – opportunities and perspectives for Romania, [Dr. Florin Oancea, http://www.marketwatch.ro/articol/13425/Bio-economia_oportunitati_si_perspective_pentru_Romania/](http://www.marketwatch.ro/articol/13425/Bio-economia_oportunitati_si_perspective_pentru_Romania/), 29/09/2014, quoting processed data from the Romanian National Institute for Statistics (2012).

Among its specific programme objectives, Romania’s national RDI Programme 2014–2020 identifies the bioeconomy as a smart specialisation priority. Allocated funding for Priority 3: Development of RD Capacity and Infrastructure (45% of the programme allocation) – Action 3.1: Large RD Infrastructure is focused on the four smart specialisation domains (SSDs), including the bioeconomy, although the programme document does not explicitly earmark or direct funding to the bioeconomy. Moreover, Priority 4: Creating synergies with H2020 (15% of the programme allocation) – Action 4.2: Attracting highly skilled foreign staff to consolidate R&D capacity includes the four SSDs and explicitly mentions the bioeconomy; however, the programme does not indicate a specific allocation for each sector.

The Competitiveness Operational Programme (COP) includes thematic funding within Action 1.1.3: Creating synergies with the H2020 RDI actions and with other international programmes (under PA1, Specific Objective 1.2: Increase participation in EU research). The funding scheme will support European Structural and Investment Fund (ESIF) projects for (i) European Research Area (ERA) chairs, (ii) ‘teaming’ and (iii) creating support centres for drafting H2020 project proposals (or other international programmes). The National Rural Development Programme has set aside EUR 1,958,334.49 in total public and private investments at the national level for energy from renewable sources in line with Priority/DI 5C: Facilitating the production and use of renewable energy sources, by-products, wastes, residues and other non-food raw materials for the bioeconomy.

As programming and implementing bioeconomy strategic approaches reach a moderate level of maturity, the backbone that supports progress is mainly made up of research structures, centres and institutions which receive all types of funding. The two major public (national and EU) and private funding sources have only recently starting investing in public-private partnerships. Public national funding for research, particularly with regard to the bioeconomy, has two major focus points: stand-alone research institutes or institutes/centres under the authority of academic or ministry structures; and public higher education institutions, universities and faculties. As Figure 5.2 shows, there has been a consistent decrease of more than one third of the number of RDI institutions in Romania in several sectors over the relatively short period of time from 2011 to 2014. Despite past crises and current public spending reforms, this drop is not due to public sector adjustments; rather, private sector research organisations are entirely responsible for the decrease.

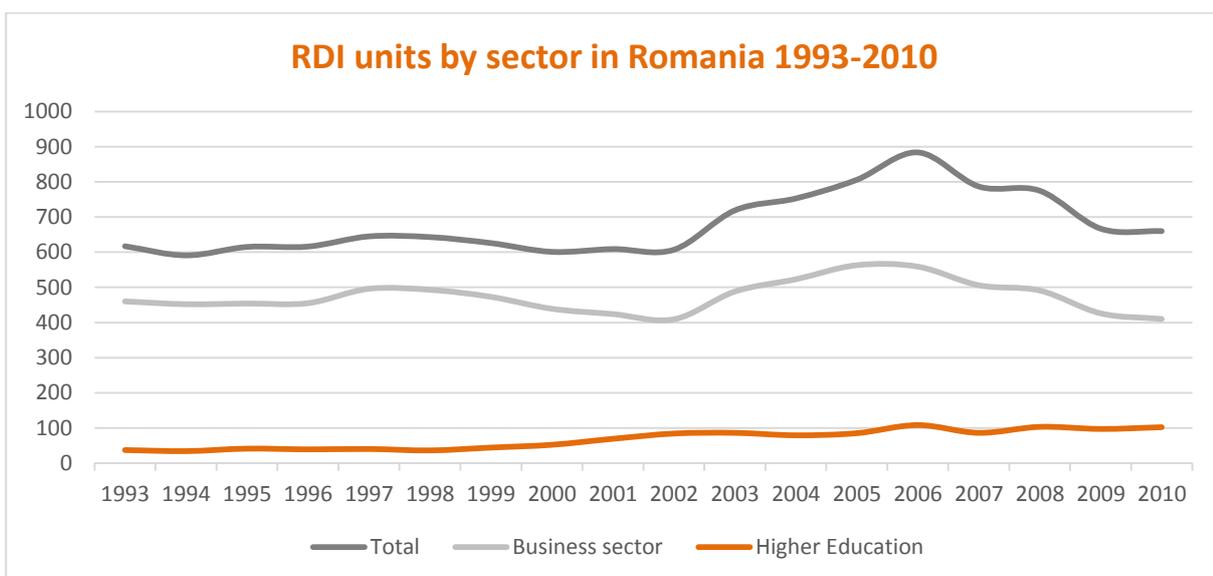
Figure 5.2. Change in the number of RDI institutions in Romania for 2011–14 (selected sectors).



Source: Based on data from the National Institute for Statistics of Romania, TEMPO Online data series, 09.2016

As Figure 5.3 shows, during the period from 1993 (long before EU pre-accession negotiations for Romania began) to 2010, which corresponds to the middle of Romania’s first programming period as a new EU member state, the country experienced a first decade of relative constancy followed by rapid growth and then a rapid decline in the total number of RDI institutions. Over the last decade in the figure, higher education institutions continue to show a relative stabilisation. The changes in total number across all sectors are due to the business sector, which is again responsible for the negative trend. For the entire period, the major shifts in the total number of organisations are nearly all caused by the changes in private structures.

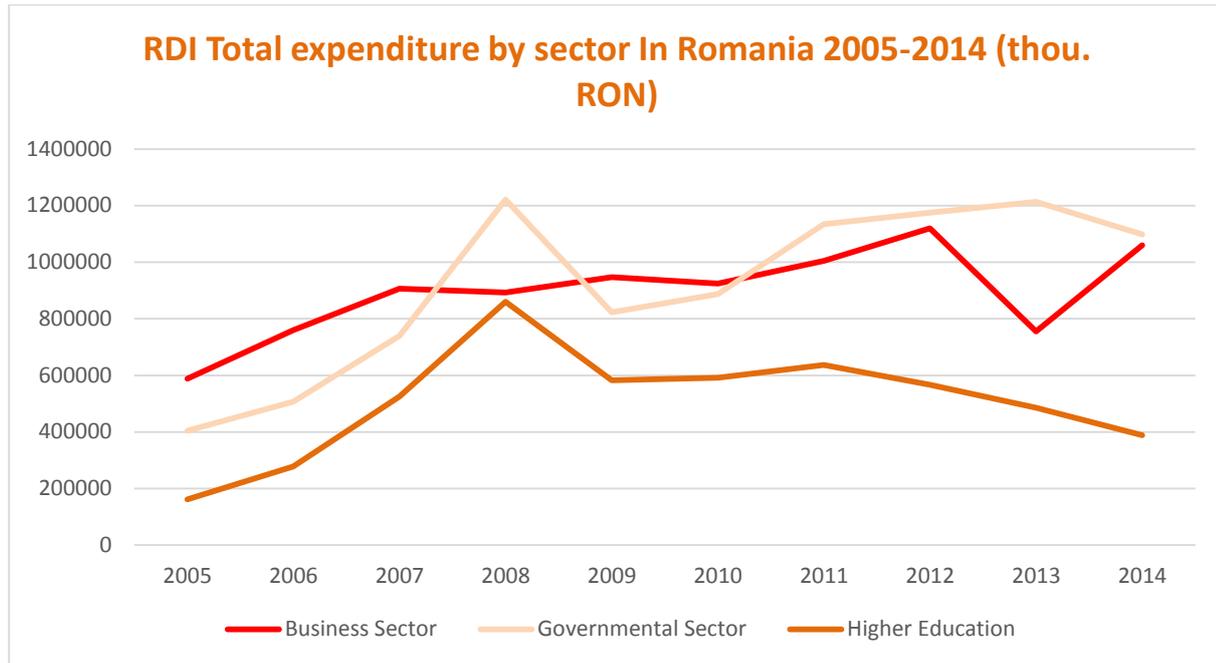
Figure 5.3. Change in the number of RDI institutions in Romania 1993–2010 (selected sectors).



Source: based on data from the National Institute for Statistics of Romania, TEMPO Online data series, 09.2016

RDI expenditure in Romania for the 2005–14 decade (Fig. 5.4) highlights a moderate increase for the business sector (except for 2013, for which there is no ready explanation) and a more pronounced rise for the government sector after recovery from the crisis years. Although the first half of the decade showed a parallel trajectory for the government sector and higher education institutions, their paths seem to diverge completely following the crisis.

Figure 5.4. RDI expenditure in Romania (selected sectors).



Source: based on data from the National Institute for Statistics of Romania, TEMPO Online data series, 09.2016

This trend is explained by two different factors: cuts to relatively uniform distribution of funds for research in higher education institutions as a result of post-crisis reforms to public funds, and the potential shift from FP7 to Horizon 2020 that consistently reduced the number of projects and project-based funding from EU sources. This competition for RDI funds from both national and EU sources could be the major cause for the continuous decline in research expenditure for the second half of the analysed decade.

Based on this background information and the bioeconomy research that is closely aligned with the priorities and opportunities set out in the national programmes and strategies – and which may be further amplified through European and international projects – there is one critical aspect that may determine the readiness and the fitness of Romanian bioeconomy actors. A brief analysis of research advantages and disadvantages at higher education institutions (HEIs) is presented in Table 5.4. Among bioeconomy research players, HEIs are in a well-connected environment, with an abundance of active contacts, frequent exchanges and fluent networking given the large number of international projects these structures have partnered on. This volume and type of experience have also helped HEIs to participate in joint RDI projects, especially in an extremely competitive international environment. Another major advantage is that usually these structures are very well staffed in certain situations – even overstaffed at times. However, the quality and skills of the research staff are extremely valuable and core assets of the respective departments, centres and

institutes. These positive points offset the disadvantages, the most critical of which is a reduced funding capacity, since all public HEIs are highly dependent on ministry budgets and fundraising efforts, which tend to be quite low. Additionally, according to the type of planned market development, the legal limitations in terms of developing own or joint business structures represent can often be major roadblocks. A typical disadvantage is weak links between the business sector and society, which creates development bottlenecks across most of new EU member states.

Table 5.4. Bioeconomy research advantages and disadvantages for higher education institutions.

Advantages	Disadvantages
+ Experienced in joint international research	- Reduced financial capacities
+ Connected (contacts, exchanges, networks)	- Legal limitations
+ Well-staffed	- Weak business/society links

The advantages of universities doing research in bioeconomy under current circumstances can be summarised as follows:

1. Readiness to operate at regional and international scale in a global environment while supporting national bioeconomy strategies/policies
2. At the forefront of implementing research at regional transnational level compared to most other stakeholders
3. Flexible and fast in adjusting strategic priorities at institutional level given the possibility for immediate change and adjustments
4. High interest in actively joining bioeconomy clusters/networks/consortia
5. Experienced in testing new technologies, processes, approaches and developments

For these reasons, in the short term universities and HEIs will play a central role in bioeconomy developments in terms of both the market and in stakeholder interactions. In the medium and long terms, they will also work to consolidate a key position. All agricultural science universities in Romania have made the development of bioeconomy programmes a high priority and they continue to ensure that research and innovation find practical applications. As a result, the impact they will have on the bioeconomy will considerably enhance their status and visibility as major players and joint actors over the coming decades.

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