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Progress and Challenges of the Bioeconomy in Uruguay: Some Reflections on Governance from a multilevel perspective

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Abstract
This paper discusses the outcomes of the R+D project 'Is the Bioeconomy a Plausible Strategy for Sustainable Human Development in Northeastern Uruguay? Theoretical-Conceptual Discussion and Empirical Bases for its Implementation', funded by the Sectoral Commission for Scientific Research (CSIC, by its acronym in Spanish) of the University of the Republic (UDELAR) in Uruguay 2021 - 2023). The project examined the potential of bioeconomy as a model for socio-technical transformations towards more environmentally sustainable formats with greater social inclusiveness, focusing on the Northeastern region of Uruguay (departments of Rivera, Tacuarembó and Cerro Largo). This paper presents findings from a multilevel and multi-stakeholder governance perspective. At the international level, there is currently a lack of governance frameworks related specifically to the bioeconomy paradigm. However, various countries have outlined some strategies to respond to the challenges of sustainable development and to potentially develop future governance schemes. This text explores the bioeconomy as a political initiative within governmental agendas in Latin America, where Argentina and Brazil are recognized as significant actors, while Uruguay made some efforts to develop a National Bioeconomy Strategy. The State has been instrumental in promoting the bioeconomy through public policies and inter-institutional cooperation. Diverse perspectives and initiatives of non-State actors have been taken into consideration. The private sector and foreign investment have also made significant contributions to the growth of certain sectors. However, there are challenges in

implementing the bioeconomy paradigm at the territorial level. This is an important fact in order to evaluate its future projections.

Keywords: Bioeconomy. Sustainable human development. Governance. Northeast region Uruguay

Avanços e desafios da bioeconomia no Uruguai: reflexões em termos de governança

Resumo
Este artigo apresenta os resultados do projeto de P+D "A bioeconomia é uma estratégia plausível para o desenvolvimento humano sustentável no nordeste do Uruguai? Discussão teórico-conceitual e bases empíricas para sua implementação", financiado pela Comissão Setorial de Pesquisa Científica (CSIC) da Universidade da República (UDELAR) (Uruguai) (2021 -2023). O projeto analisou criticamente o potencial da bioeconomia como um possível paradigma para transformações sociotécnicas em direção a modos de vida, produção e consumo que, fornecendo bases materiais, também constituem formatos ambientalmente mais sustentáveis e com maior inclusão social, com foco na região Nordeste do Uruguai (departamentos de Rivera, Tacuarembó e Cerro Largo). O trabalho apresenta resultados relacionados à governança com uma perspectiva multinível e multissetorial. Em nível internacional, não foram desenvolvidos marcos de governança específicos relacionados ao paradigma da bioeconomia. Em nível internacional, não foram desenvolvidos marcos de governança específicos relacionados ao paradigma da bioeconomia. No entanto, vários países delinearam estratégias para responder aos desafios do desenvolvimento sustentável. Isso se aplica à América Latina, onde a bioeconomia como projeto político está dentro das agendas do governo, onde Argentina e Brasil são considerados atores-chave. O Uruguai começou a traçar diretrizes para uma Estratégia Nacional de Bioeconomia. O Estado tem desempenhado um papel fundamental, com políticas públicas de fomento à bioeconomia e à cooperação interinstitucional, buscando contemplar diversas perspectivas e iniciativas de atores não estatais. O setor privado e o investimento estrangeiro impulsionaram certos setores. No entanto, existem dificuldades no desenvolvimento do paradigma a nível territorial, o que é relevante para avaliar projeções futuras.

Palavras–chave: Bioeconomia. Desenvolvimento humano sustentável. Governança. Região Nordeste do Uruguai.

**Avances y desafíos de la bioeconomía en Uruguay:
reflexiones en clave de gobernanza**

Resumen
Este artículo presenta resultados del proyecto I+D "¿Es la bioeconomía una estrategia plausible de desarrollo humano sustentable para el noreste de Uruguay? Discusión teórico-conceptual y bases empíricas para su implementación", financiado por la Comisión Sectorial de Investigación Científica (CSIC) de la Universidad de la República (UDELAR) (Uruguay) (2021 -2023). El proyecto analizó críticamente el potencial de la bioeconomía como posible paradigma para transformaciones socio-técnicas hacia formas de vida, producción y consumo que proporcionando bases materiales, también constituyan formatos

ambientalmente más sustentables y con mayor inclusividad social, focalizando la región noreste del Uruguay (departamentos de Rivera, Tacuarembó y Cerro Largo). El trabajo despliega hallazgos relativos a la gobernanza con perspectiva multinivel y multiactoral. A nivel internacional no se han desarrollado marcos de gobernanza específicos relativos al paradigma de la bioeconomía. No obstante, distintos países han esbozado estrategias para responder a los retos del desarrollo sostenible. Esto aplica a Latinoamérica, donde la bioeconomía como proyecto político juega dentro de las agendas de gobierno, donde Argentina y Brasil son considerados jugadores claves. Uruguay ha comenzado a esbozar lineamientos de una Estrategia Nacional de Bioeconomía. El Estado ha jugado un rol fundamental, con políticas públicas de promoción de la bioeconomía y cooperación interinstitucional, esforzándose por contemplar diversas perspectivas e iniciativas de actores no estatales. El sector privado y las inversiones extranjeras impulsaron determinados sectores. Sin embargo, existen dificultades para el desarrollo del paradigma a nivel territorial, lo que resulta relevante para evaluar proyecciones a futuro.

Palabras clave: Bioeconomía. Desarrollo humano sustentable. Gobernanza. Región Noreste de Uruguay.

Introduction

This paper discusses some results of the R+D project "Is bioeconomy a plausible strategy for sustainable human development in Northeastern Uruguay? Theoretical-conceptual discussion and empirical bases for its implementation", funded by the Regional Commission for Scientific Research (CSIC) of the University of the Republic (UDELAR, by its acronym in Spanish) and carried out from April 2021 to August 2023. This project aimed to critically analyze the potential of bioeconomy as a possible paradigm that may guide and promote the socio-technical transformation towards ways of life, production and consumption, providing material bases while constituting more sustainable formats from the environmental point of view and greater inclusiveness from the social point of view. In this regard, assuming the complexity of approaching a polysemous concept as bioeconomy, the reflection was based on the sustainable human development approach as an analytical framework, focusing on the Northeast region of Uruguay (Rivera, Tacuarembó and Cerro Largo Departments).

As a point of reference, it is worth noting that some initiatives in Uruguay have included a study on bioeconomy and its relationship with the prospective exercise promoted by the Office of Planning and Budget (OPP, by its acronym in Spanish) and entitled 'Towards a National Development Strategy 2050' (OPP, 2019). Furthermore, there is ongoing consideration for the integration of the bioeconomy approach into current national policies supported by international cooperation. Based on these precedents, the project analyzed in this article aimed first at understanding the multiple meanings and definitions surrounding the concept of bioeconomy and its relationship with sustainability, the transformation of the production and consumption dynamics of our societies, the scope of economic growth, the role of science, technology and innovation policies and the creation of governance schemes that underpin changes that overcome the constraints dependent on the trajectories.

Furthermore, the eventual implementation of the conceptual proposal of the bioeconomy in Uruguay was explored, considering the background of the current situation. Based on this, the regional socio-productive framework was considered and finally, the perceptions of the different actors were analyzed taking account of their practices and expectations regarding the transformative potential of sectors visualized as bio-economically strategic.

Furthermore, the project deployed an interdisciplinary strategy with a collaborative work approach from different roles: the diversity of backgrounds and academic trajectories of the team members covered disciplines such as Economics, Political Science, Development Studies, Agronomy, Communication Science, Veterinary and Psychology. A fundamental factor was given by the commitment to the co-production of knowledge, which enabled the design of the aforementioned interdisciplinary strategy that enriched each of the phases of the project, overcoming the sum of approaches to achieve the integration of knowledge in the design of the fieldwork, the implementation of actions and the analysis of the results.

Based on this strategy four main dimensions of analysis were defined: i) the Economic-productive dimension, ii) the Socio-environmental dimension, iii) the Science, Technology and Innovation dimension, and iv) the Governance dimension. From the methodological point of view, the project followed a strategy that combined different methods, with a quantitative and a qualitative component, where different techniques were deployed accordingly to address the above-mentioned dimensions. These dimensions were not conceived as watertight components but were interrelated during the whole project, with a permanent flow and triangulation of the information gathered by this interdisciplinary team. One central motivation was to analyze how productive actors, civil society understood in a broad sense (for example, large and small producers and their respective unions, academia, professionals and technicians, social organizations, non-governmental organizations (NGOs) and state actors linked to decision-making, perceive the transformative potential of those sectors that are seen as strategic in terms of the bioeconomy. On the other hand, the team sought to understand their positions and articulations in the face of the regulatory and institutional frameworks that configure governance schemes related to the bioeconomy, as well as the challenges of socio-technical transformations.

Significantly, some important cleavages in perceptions regarding the relevance of certain conceptual approaches and their translation into policies and strategies were observed: specifically, the team identified dividing lines of confrontation between the positions of different actors. These lines represent decisive elements of the structure of political opportunities, affecting the motivations of the actors involved in social conflicts. Here, too, an attempt was made to generate a multilevel analysis regarding state and non-state institutions that produce and reproduce certain forms of governance in some specific sectors with 'bioeconomic' potential. This offered the analytical possibility of observing and studying the extent to which there is an interrelation and eventual co-evolution between the processes of institutional change (political spaces where strategies and

aspects linked to political economy are defined) and the effective transformations at the level of the actors of the socio-productive framework.

Due to the importance of these cleavages affecting the structure of political opportunities and their impacts on the analyzed territory, this paper - while considering the general results of the project- concentrates on findings related to the Governance dimension, which were collected within the qualitative component through techniques such as bibliographic and documentary review, as well as focus groups and semi-structured interviews with national and territorial level referents. The decision to focus on the governance dimension is based on the observation that the processes of coordination, articulation and decision-making between public, private and social actors are decisive in providing viability and territorial coherence to bioeconomic strategies. In this context, governance is understood as a key element to move towards sustainable human development models, since it allows us to recognize the institutional and power frameworks that guide the implementation of the bioeconomy paradigm, as well as the tensions and opportunities that arise between the different actors and levels.

After this introduction, we first outline some elements of the analytical framework referring to the concept of governance from a multilevel and multi-stakeholder perspective. The second section provides a characterization of existing governance regimes in bioeconomy. The third section describes the situation in Latin America and Uruguay, with its linkage to governance regimes related to bioeconomy. The fourth section develops some results related to the Governance dimension of the project, culminating in the last section with some future projections.

1 Analytical Framework: Approaches to the Concept of Governance and Bioeconomy

As Pía Riggirozzi and Christopher Wylde (2018: 1) point out, governance represents a key issue of our times: following contributions from Gamble (2014) and Jessop (2016) the mentioned authors refers to the concept as the complex ways in which human interaction takes place within and outside the space of the nation state, and that interaction is regulated and governed. Nonetheless, they underline that governance is not only about interactions, but also about how institutions regulate social, economic and political processes by which power and influence are put into practice, outcomes are shaped and decisions made and implemented (CERNY, 2014). In this view, in practice governance involves strategies pursued by state and non-state actors aiming at enhancing their capabilities and power of agency.

In its origin the governance approach refers to institutional economics, whose origins date back to the first decades of the 20th century, while also recognizing contributions from the regulation school, which emerged in the 1970s within a context of crisis: thus, the concept was linked to the market, seeking to optimize regulation and public intervention processes, facilitating decision making by the rest of the social actors. Progressively, the concept was incorporated into disciplines such as political science and administration, focusing on relational schemes of horizontal logic. At the same time, the development of this analytical category implied a more

inclusive management tenor, allowing diverse social agents to assume responsibilities, in contrast to more traditional-bureaucratic models, marked by enforcement. Given its polysemic connotation, the concept of governance was adopted by different theoretical approaches (new public management of the new right, neo-institutionalism or community universalism of civil society and non-governmental organizations (FARINÓS DASÍ, 2008: p.12).

On the other hand, the study considered recent debates on the need for new forms of territorial governance and the management of development-oriented policies, i.e., new forms of governance. As Farinós Dasí (2015) points out, this implies both multilevel articulation (HOOGHE and MARKS, 2001; MARKS and HOOGHE, 2004), as well as the dimension of participation at the horizontal level and its inter-sectoral coordination in order to achieve coherence in actions. In addition, emphasis is placed on strengthening participation in a deliberative format, to foster democratic values and achieve desirable levels of governance (FARINÓS DASÍ, 2015). In contrast to a model focused on the notion of government (where the presence of State power is visible in a framework of hierarchical and bureaucratic relations), the idea of governance broadens the perspective by covering a broader system of relations that expressly includes other non-traditional actors in the political sphere. This would represent an alternative format that transforms the management of public affairs (CARMONA, 2006; FARINÓS DASÍ, 2008). The innovation of this dynamic, based on new formal and informal institutional frameworks within the different territorial spaces, would be based on the impulse to create networks and spaces for public participation, highlighting the trusting relationships between those involved (KOOIMAN, 2003; MONCAYO 2002). Nonetheless, it must be stressed that different institutional arrangements can coexist and act in a territory, each with its own agendas for development (SERRA BORSATTO, ANTUNES JUNIOR and FERREIRA SOUSA-ESQUERDO, 2020). According to Tatiani Sobrinho Del Bianco, Camilo Freddy Mendoza Morejon and Ricardo Rippel it is worth noting that, when discussing the term 'territorial development', performance indicators should not only be based on economic and social variables, but also on those related to the environment. This approach could enable a comprehensive assessment of the territory, contributing to identify its profile of sustainable territorial development.

For greater precision in discussions on governance, we should mention the particular historical moment that humanity is going through, marked by the beginning of what some views consider to be a new geological era called the Anthropocene, precisely because of the human-induced nature of the risks facing the planet. Among them, climate change is a significant issue, and its solutions require the involvement of territorial levels and local communities (UNDP, 2020: 33-34; 36). In turn, recent analyses underline the relevance of developing strategies that explicitly consider the 2030 Agenda as necessary to achieve transformations in socio-economic, territorial, environmental, and urban models. In this regard, adequate governance is essential to ensure planning and management in accordance with the general interest and environmental sustainability, as well as the necessary adaptation to phenomena such as climate change (FARINÓS DASÍ et al., 2020). In this context, the agreements related to the Agenda 2030, such as the Sustainable Development Goals (SDGs) and the Paris Agreement, represent institutional innovations milestones that mark a significant change in governance forms. These forms have evolved from

a conception based solely on norms and rules to one that incorporates monitoring goals achievement. In particular, this raises the challenge of action coherence with unprecedented levels of coordination and cooperation (KANIE et al., 2019).

Regarding this case study, from the perspective of sustainable territorial governance, the aim was to analyze the institutional arrangements that can make innovative dynamics viable and contribute to the so-called 'socio-technical transitions' (GEELS, 2011). A contribution in this regard is provided by the report of the Economic Commission for Latin America and the Caribbean (ECLAC - CEPAL, by its acronym in Spanish) (CEPAL, 2020), which outlines lines of reflection and action for a transformative recovery after the COVID-19 pandemic, with a focus on equality and sustainability. In relation to the specific issue of bioeconomy discussed in this paper, it is necessary to emphasize the need to systematically address the complexity that arises from the definition and scope of the concept of the bioeconomy as such, in order to implement actions aimed at its development as a productive paradigm. This does not mean that an operational concept cannot be identified: in fact, the project team chose a definition linked to the categorization proposed by the Global Bioeconomy Summit 2018. There, the concept of bioeconomy was connected with the production, use and conservation of biological resources, including related knowledge, science, technology and innovation, to provide information, products, processes and services in all economic sectors, in pursuit of a sustainable economy. Thus, as Guy Henry, Elizabeth Hodson de Jaramillo, Rafael Aramendis, Eduardo Trigo and Sara Rankin (2019) point out, the bioeconomy approach implies a dynamic and complex social transformation process, where long-term policies are necessary. It proposes a vision of a sustainable bioeconomy linked to the greening of the economy with new bio-based industrial processes and products, which would entail changes in consumer behavior.

2 On Bioeconomy Governance Regimes

According to Deciancio et al. (2022), no specific governance framework related to bioeconomy has yet been developed at the global level, although it is undeniable that the paths of bioeconomic transformations tend to involve multiple impacts with global implications, i.e., beyond national borders. As a result, international and regional organizations and international cooperation are expected to play an important role in the eventual governance, promotion and regulation of bioeconomy. The authors emphasize that the extent to which bioeconomy can effectively promote sustainable development depends to a large extent on the role of States, both at the level of their national policies and their positions at the global level, including their political will and capacity to address sustainability concerns. In this way, States would play a central role as both promoters and regulators of bioeconomy strategies at different levels. In this regard, factors such as the level of development, available resources and the political system of each nation influence the transformative processes through which each country evolves towards the establishment of its bioeconomy strategies. In line with Mazzucato (2013), all the above implies a high degree of intervention and innovative methods to promote the interaction between the public and private sectors.

When analyzing the international level, it is possible to identify some approaches that outline possible future governance schemes or regimes, framed within the needs and strategies of different countries, in order to respond to the challenges of sustainable development. As an example of the search for concrete forms of cooperation, it is worth mentioning the creation in 2015 of the International Advisory Council on Global Bioeconomy (IACGB) to support the organization of the first Global Bioeconomy Summit, which took place in the same year. During this Summit, efforts were made to portray bioeconomy as a path that can significantly contribute to the implementation of the 2030 Agenda for Sustainable Development, promoting different aspects of several SDGs, such as knowledge-based growth, resource renewability, regeneration and resilience of ecosystems, circularity and resource efficiency, and creativity and innovation. To give continuity to this approach, the second Global Bioeconomy Summit in 2018 highlighted the role of innovation as a key factor, as well as the need to promote international cooperation to achieve an inclusive bioeconomy. At that time, bioeconomy was explicitly presented as a transformative force for promoting sustainable development. In addition, the third Global Bioeconomy Summit was held in 2020, where it was noted that the transition to bioeconomy is more critical than ever, given the urgency of environmental challenges, the opportunities offered by advances in science, and the implications of COVID-19 (IACGB, 2020).

In an attempt to systematize views on bioeconomy, from a perspective derived from the European context and according to Bugge et al. (2016), it is possible to identify different bioeconomy perspectives: a) on the one hand, a biotechnological vision focused on research, commercialization and application of innovations; b) on the other hand, a vision of biological resources framed in the capitalization of biological resources as an alternative for economic growth, and c) a bioecological perspective emphasizing sustainability, biodiversity and resource conservation. Considering some political guidelines that make it possible to imagine governance schemes in the field of bioeconomy, Hausknost et al. (2017) focus on aspects related to bio-industrial technology, linked to the inclusion of the sectoral aspect. From this, they develop a typology that is useful to illustrate the different meanings of the term and its possible translations into concrete policy models: a) the vision of "sustainable capital", which relies on a bioeconomy based on technological leadership and technological growth; b) "eco-growth", which does not propose a transition to agro-ecology, but emphasizes the role of agriculture and agro-ecological practices; c) the model of what could be called "eco-retirement," which proposes a socio-ecological transition that combines consumption, production, and distribution patterns; d) finally, the vision of a "planned transition," which proposes a combination of large-scale advanced technologies and a development pattern of sufficiency. These alternatives contradict the dominant visions of capitalism and the marginal logic of degrowth.

At the same time, understanding bioeconomy as a transformative process, Dietz et al. (2018) show that certain transformations can be triggered by the interaction of driving forces such as demographic growth, technological innovation, political or social action. Depending on the country's context and its interaction with other economies, this transformation operates on the basis of biological incentives

(substitution of fossil fuels, promotion of primary sector activities, generation of new and more efficient biomass, and low-volume, high-value applications). Many countries are implementing policies to promote bio-industries in order to strengthen and adapt the bioeconomy process through education and awareness. Thus, guidelines are established that contribute to achieving better governance by promoting research and development for a transformation of the bio-base, in addition to improving the competitiveness of the bioeconomy through subsidies, generating industrial location policies for bio-industries, as well as political support for a social transformation of the bio-base. It should be noted that promoting sustainable consumption through regulations and incentive systems is one of the many governance challenges of a sustainable bioeconomy. To achieve its goals, national bioeconomies need an effective and globally coordinated governance framework. The author points out that achieving effective governance arrangements requires control and monitoring of comprehensive approaches, understanding that a lack of this could lead to excessive or insufficient regulation of the bioeconomy.

Considering bioeconomy as a transformative process, Scoones et al. (2020) emphasize the importance of transformation towards sustainability, understood as fundamental changes in the functional, relational and cognitive structures of socio-technical-ecological systems, leading to new patterns of interaction and outcomes (PATTERSON et al., 2017). This defines three theoretical approaches that contribute to the understanding of the bioeconomy from a number of perspectives that implicitly refer to different forms of governance. On the one hand, this process can be understood from a structural approach, noting that achieving new transformations requires changes in production, consumption, societies, and ideological shifts. At the same time, from a systemic approach, changes are mentioned that focus on systems with interdependent parts: institutions, political technologies; the concept of complex systems and ecological dynamics are discussed. Also, from enabling approaches, the need to focus on the creation of social attributes and capabilities to empower individuals and achieve the desired transformation is established, it has an optimistic view of how to achieve changes for sustainability. From these approaches emerges the need to assess local realities, where each system presents its particular vulnerabilities and opportunities to be considered (SCOONES et al., 2020).

3 Latin America and Uruguay vis-à-vis Governance Regimes Related to Bioeconomy

3.1 The Regional Perspective

As in the case of the global level, within the Latin American region, there has been no specific development related to bioeconomy governance regimes either. Even if bioeconomy has potential relevance for Latin America (RODRÍGUEZ-VARGAS, 2019), it has not been given due attention in the public policies of the countries in the region. At present, there is a lack of explicit regional strategies for bioeconomy, in contrast to Europe. Nevertheless, there are ongoing initiatives related to bioenergy, biotechnologies, biodiversity, and environmental services that could potentially serve as a foundation for its future development. In Latin America, one of the formal processes for developing a framework strategy with territorial strategies of

bioeconomy is the one developed in Argentina, which is linked to the concept of 'smart territories'.

As Rodriguez Vargas (2019: 163-164) points out, it is believed that bioeconomy has the potential to serve as a framework for guiding productive development and innovation policies in the context of the 2030 Agenda for Sustainable Development. This can be achieved by building on existing institutional bases and public policy development in the region.

Although there are currently no established bioeconomy regimes in Latin America, Siegel et al. (2022) state that several countries are actively working towards implementing the concept into their national bioeconomy strategies; different proposals and policy documents aim to promote a transition towards greater sustainability. However, it has been noted by several studies on governance in the field of bioeconomy (DIETZ et al., 2018; BIBER-FREUNDENBERGER et al. (2020), that sustainability benefits cannot be guaranteed. Additionally, Siegel et al. (2022) highlight the fact that the concept of bioeconomy can be interpreted in various ways, with different outcomes prioritized in terms of sustainability. For this reason, it is important to recognize that any potential transition in this matter is a complex political process, involving multiple actors with different interests that may eventually diverge (KÖHLER et al., 2019).

According to Delvenne and Hendrickx (2013), Argentina and Brazil are considered important contributors to the global bioeconomy within the Southern Cone area. Argentina has tried to position itself as a leader in the region, drawing inspiration from organizations such as the CEPAL and the Inter-American Institute for Cooperation on Agriculture (IICA, by its acronym in Spanish). Additionally, European organizations have contributed to the promotion of some emphases and the establishment of institutional networks, leading to the incorporation of specific concepts, practices, and ways of conceiving bioeconomy. As Siegel et al. (2022) point out, it appears that there is a need for more studies that explicitly address the concept of bioeconomy in the context of South America within the field of Social Sciences. It is worth noting that the literature still heavily focuses on industrialized countries. CEPAL has conducted various studies on bioeconomic dimensions in the region, including the assessment of biodiversity and ecosystem services, bioenergy and biomaterials, eco-intensification of agriculture, biotechnology, and improving the efficiency of agrifood chains. Significantly, the sectors mentioned here are not entirely new fields. Rather, the concept of bioeconomy has been employed to advance and improve a specific type of natural resource utilization that has already been in existence for some time and has been subject to examination (SIEGEL et al., 2022).

On the other hand, Hodson de Jaramillo (2019) emphasizes that the bioeconomy approach is viewed as a potential alternative to promote sustainable development and green growth in Latin America and the Caribbean, given the region's abundant biodiversity and biomass production capacity. According to this vision, regional capacities and cooperation in biotechnology and other technologies should be strengthened to address the issues of emission reduction, mitigation and adaptation to climate change along the value chains. The author points out that by the end of the second decade of the 21st century, Argentina was the most advanced country in the region in terms of implementing actions for the development of a

bioeconomy strategy, focusing on food and energy sectors. In August 2020, the National Directorate of Bioeconomy (DNB, by its acronym in Spanish) was established within the Ministry of Economy and its Secretariat of Agriculture, Livestock and Fisheries (SAGIP, by its acronym in Spanish), under the Undersecretariat of Food, Bioeconomy and Regional Development. The DNB comprises two coordinations: Innovation and Biotechnology, and Bioenergy.[1] After the change of government led by Javier Milei in December 2023, some changes were made to the organizational chart related to the bioeconomy. The aim is to prioritize this approach, with plans to rename SAGIP as the Secretariat of Bioeconomy. This new department will report to the Ministry of Economy.

In Brazil, national agencies have developed various policies within the framework of an Action Plan for Science, Technology, and Innovation in Bioeconomy (PACTI Bioeconomy). These policies aim to produce and apply scientific and technological knowledge to promote social, economic, and environmental benefits, foster innovation, and strategically position the bioeconomy in the global scenario (HODSON DE JARAMILLO, 2019). In 2021, the Brazilian Bioeconomy Program - Socio-biodiversity was created within the scope of the Ministry of Agriculture, Livestock and Supply (MAPA, by its acronym in Portuguese). The program aims to coordinate actions in bioeconomy in the country's domestic market and defines five axes: productive structure of extraction chains, medicinal herbs, aromatic herbs, condiments, oils, and special tees from Brazil, renewable energies for family farming, recognition of traditional agricultural systems, and socio-biodiversity routes.[2]

On the other hand, Colombia has implemented a comprehensive strategy to address the main dimensions of bioeconomy in the country. In 2020, the Ministry of Science outlined a roadmap for Science, Technology, and Innovation policies that focus on sustainable development based on Colombia's knowledge. The strategy emphasizes green growth and combines bioeconomy, circular economy, and forest economy with non-conventional sources of renewable energy (GOVERNMENT OF COLOMBIA, 2020). The Bioeconomy and Territory Mission roadmap was ratified in 2023 as part of the Mission-Oriented Research and Innovation Policies (PIIOM) outlined in the National Development Plan 2022-2026 "Colombia World Power of Life" and the national government's Re-industrialization Policy.[3]

The experience of Costa Rica is also noteworthy. In 2020, they proposed the National Bioeconomy Strategy with a projection to 2030. The strategy aims to promote innovation, value addition, diversification, and sophistication of the economy. It applies the principles of the circular bioeconomy and seeks to decarbonize product and consumption processes. Costa Rica aims to become a model country for sustainable development by utilizing its biological resources to promote social inclusion, equity, territorial development, conservation, knowledge, and sustainable use of its biodiversity, as outlined in the National Strategy of Costa Rica (2020).

[1] https://www.argentina.gob.ar/agricultura/bioeconomia

[2] https://opsaa.iica.int/frame-2552

[3] https://minciencias.gov.co/sites/default/files/upload/noticias/1._documento_de_politica_bioeconomia_y_territorio.pdf

3.2 The Situation in Uruguay: Background

As already mentioned in the Introduction, Uruguay has been exploring the concept of bioeconomy for ten years, since in 2015, the OPP acknowledged bioeconomy as a potentially transformative and sustainable driving force. Furthermore, in 2017, the country joined the International Sustainable Bioeconomy Working Group (ISBWG) of the United Nations Food and Agriculture Organization (FAO).[4] During the government led by the Frente Amplio (Broad Front) coalition, guidelines were outlined for a National Bioeconomy Strategy. The strategy considered three approaches: Bioeconomy, Green Economy, and Circular Economy, and explored the potential synergies between them. During the development process of the Sustainable Bioeconomy Strategy, several ministries and governmental agencies worked together with the support of international organizations such as the FAO, the CEPAL and the IICA. An Inter-institutional Working Group on Sustainable Bioeconomy (GIT-BS, by its acronym in Spanish) was created. This Group was led by the Ministry of Livestock, Agriculture, and Fisheries (MGAP), including several other government entities such as the OPP, the Ministry of Industry, Energy and Mining (MIEM), the Ministry of Environment, the Ministry of Economy and Finance, the Ministry of Education and Culture, the Ministry of Labor and Social Security, the Ministry of Tourism, and the National Secretariat of Productive Transformation and Competitiveness (IICA, 2020). Workshops were conducted with the technical support of the United Nations, involving government actors and the private sector, to exchange insights, identify strategic directions, and explore productive opportunities.

In summary, it can be stated that up to that time the State and public policies have played a central role in promoting bioeconomy. Additionally, the private sector and foreign investments were also seen as drivers for the development of certain bioeconomic sectors. A multi-actor approach was employed, with the State playing in that period a central role in the development of the bioeconomy strategy with inter-institutional cooperation. Various perspectives and initiatives from non-State actors were also considered. It should be noted that several important sectors, including agriculture, livestock, forestry linked to the cellulose industry, and the policy of a new energy matrix, were expected to play a significant role in developing the bioeconomy in Uruguay. Furthermore, the utilization of forest biomass resulting from cellulose production has aided in diversifying the energy matrix by replacing fossil fuels with renewable energies. It is worth mentioning that the development of this dimension at the national level is backed by State policies and regulations, such as the Forestry Law passed in 1987. This law recognized the forestry sector as being of national interest, and it incentivized investment and the establishment of cellulose plants through State subsidies and tax exemptions (from customs and national tax). The energy policy was approved in the country in 2005 with a long-term vision (for the period 2005-2030) and had the consensus of all political parties and the

[4] https://my.southsouth-galaxy.org/en/solutions/detail/fao-led-international-sustainable-bioeconomy-working-group

participation of the main public actors in the sector. Its main objective was to diversify the energy matrix, reduce costs and dependence on oil, and promote energy resources, particularly renewable ones (SIEGEL et al., 2022).

Since 2020, in the context of a new national coalition government led by President Luis Lacalle Pou of the Partido Nacional (National Party), the issue of bioeconomy was associated with a productive transformation based on the country's available biological resources, improve sustainability, and generate new value networks, while complying with international commitments such as the SDGs. At the same time, the aim was to position Uruguay as a provider of bio-products and services with added environmental value, by generating a national brand. The strategy draft focuses on topics as Inclusive Territorial Development, Sustainability of consumption and production, Sustainable international insertion, and Science Technology and Innovation oriented to the bioeconomy (National Bioeconomy Strategy of Uruguay, 2021). As outlined in the following section, the March 2020 government transition resulted in notable shifts in the approach to bioeconomy.

4 Main Findings of the Project Regarding the Governance Dimension

As already mentioned, the current absence of global governance schemes that are specifically related to bioeconomy is highly significant, even if bioeconomic transformations often have diverse impacts at the global levels with international and regional organizations, as well as international cooperation playing a leading role in the promotion, and regulation of the bioeconomy. In Latin America, institutions such as ECLAC, IICA, and FAO are considered to be strategically significant promoters of the bioeconomy paradigm.

Regarding some central project's findings, Figure 1 below summarizes the main institutional and policy milestones that have shaped Uruguay's bioeconomy governance since 2015 until the end of the CSIC project, providing a contextual framework for the analysis that follows.

Figure 1: Evolution of Uruguay's Bioeconomy Governance: Institutional and Policy Milestones (2015–2023)

2015 → OPP includes bioeconomy in National Development Strategy 2050

2017 → Uruguay joins FAO's International Sustainable Bioeconomy Working Group

2019 → Draft National Bioeconomy Strategy presented and creation of GIT-BS interministerial group

2020 → Change of government: shift towards Circular Bioeconomy Strategy

2021 → PAGE project (UNDP–UNIDO) and BMEL cooperation initiatives

2023 → CSIC project (UDELAR) concludes: identification of governance gaps

According to the interviews conducted during the CSIC project with both national entities, the Office of Agricultural Policy and Programming (OPYPA, by its acronym in Spanish) of the MGAP, and MIEM, as well as with international organizations such as FAO, suggest that international cooperation has had a significant impact on promoting the bioeconomy approach in the country. The German cooperation supported various initiatives such as the Partnership for Action on Green Economy (PAGE) project, established in 2013 to assist countries in pursuing more sustainable and equitable green growth paths. Furthermore. the Bundesministerium für Ernährung und Landwirtschaft (BMEL), supported various projects of research institutions, including activities of the Thünen Institute of Forest Economics (POZO INOFUENTES et al., 2023).

As already mentioned, the Sustainable National Bioeconomy Strategy in Uruguay was initially developed in 2015 and presented in draft form in 2019 at the end of the Frente Amplio government. According to representatives of OPYPA (MGAP) who were interviewed during the project, this initial strategy involved a multi-party and participatory institutional process. This process included the MGAP, MIEM, the Ministry of Environment (formerly known as MVOTMA and now continued under the Ministry of Environment), and the OPP. During that time, the already mentioned GIT-BS was established as a governance body with the participation of ten ministries and public institutions. A draft was presented with strategic goals, prioritized sectors, and four operational pillars that formed the foundation of the Action Plan to implement the strategy (KEFELI and CARRAZZONE, 2023; PITTALUGA, 2020a; PITTALUGA, 2020b). The bioeconomy approach had significant implications for science and technology and was closely linked to associated institutions such as ANII (Agencia Nacional de Investigación e Innovación by its acronym in Spanish; National Agency for Research and Innovation), INIA (Instituto Nacional de Investigación Agropecuaria by its acronym in Spanish; National Institute for Agricultural Research), and the Clemente Estable Institute, among others.

With regard to the change of government in 2020, it must be stated that the bioeconomy approach was not revisited within MGAP until Minister Fernando De Mattos took office in June 2021. The monitoring and new definitions of this approach was then entrusted to OPYPA, as it aligns with the Ministry's long-term objectives. Following a discussion on semantics, a proposal for a National Circular Bioeconomy Strategy was presented. The aim was to align with the efforts of MIEM, in coordination with UNIDO (United Nations Industrial Development Organization), and with contributions from the United Nations Development Programme (UNDP). During this period, a certain lack of cohesion among various efforts and disciplines was evident, as there was no overarching framework for development, such as that provided by the National Strategy 2050 proposed by the former government. The involvement of private actors in the development of future governance mechanisms was still in its nascent stages, and the means of connecting and coordinating them were not fully established.

Representatives from MIEM have identified a challenge related to the lack of communication among actors regarding the issue of bioeconomy. Significantly, there was a need for effective planning and a visible State policy in this area. During the project, the MIEM representatives pointed out that the primary motivation for

bioeconomy was economic profit, particularly in the private sector.[5] However, OPYPA, the agency responsible for promoting the Strategy, recognized the importance of establishing diverse and plural connections.[6] For future design, interviewees repeatedly mentioned the forestry sector,[7] large companies like UPM, and associations such as the Society of Forest Producers (SPF, by its acronym in Spanish) as potential strategic partners. However, it was noted by the current FAO representative that modalities for their participation had not yet been specified, and other sectors or scales of production should not be excluded: "Depending on how the bioeconomy is structured, it may bring other sectors to the table."[8] On the other hand, the workers' sector and its representation (PIT-CNT, the National Trade Union), along with affiliated institutes such as Cuesta Duarte, did not adopt a stance on the matter.[9]

Up to this time, there were certain aspects that required further definition regarding articulation mechanisms with territorial or subnational levels within the framework of a future bioeconomy strategy . This matter was being approached sequentially, with the model established at the National Response System to Climate Change (SNRCC, by its acronym in Spanish) as a potential guide.[10] In fact, there were clear difficulties in connecting the national approach related to bioeconomy with the subnational level (e.g. with departmental governments). Significantly, these obstacles also counted for international cooperation organizations, which was partly due to differences in thematic emphasis.[11]

At the same time, according to the General Directorate of Development and Environment of the Departmental Intendancy of Rivera (IDR), during all this period there was a lack of financial incentives or political guidelines from the national level or international cooperation regarding the bioeconomy approach in the Northeast region. However, the circular economy approach had been widely adopted. The responsibility of the national level ("the government as a whole") is also underscored for not providing a 'translation' in terms of decisive support to efforts aiming at promoting organic production methods ("economic pressure today is not supporting the theory of environmental sustainability"). Additionally, there were doubts about the effectiveness of certifications and the absence of regulations that could facilitate progress in the registration of new bio-inputs or phyto-therapeutics. While the Agricultural Planning Institute (IPA, by acronym in Spanish) or the MGAP provided some support to the productive sector, such as stimulus packages for strategies such as ‘selective grazing’, these were not considered policies to establish a trend or preference. As a result, interventions were limited to specific and isolated actions.[12]

[5] Interviews conducted on 5/15/2023 with MIEM representatives.

[6] Interviews conducted on 3/27/2023 with representatives from OPYPA (MGAP).

[7] Interviews conducted on 5/15/2023 with MIEM representatives; on 3/6/2023 with FAO representatives in Uruguay; on 3/24/2023 with National Agroecology Plan’s (MGAP) representatives; and on 3/27/2023 with OPYPA (MGAP) representatives.

[8] Interview conducted on 6/3/2023 with FAO representatives in Uruguay.

[9] Focus-group conducted on 10/18/2022.

[10] Interviews conducted on 3/27/2023, with OPYPA (MGAP) representatives.

[11] Interviews conducted on 6/3/2023 with FAO representatives in Uruguay.

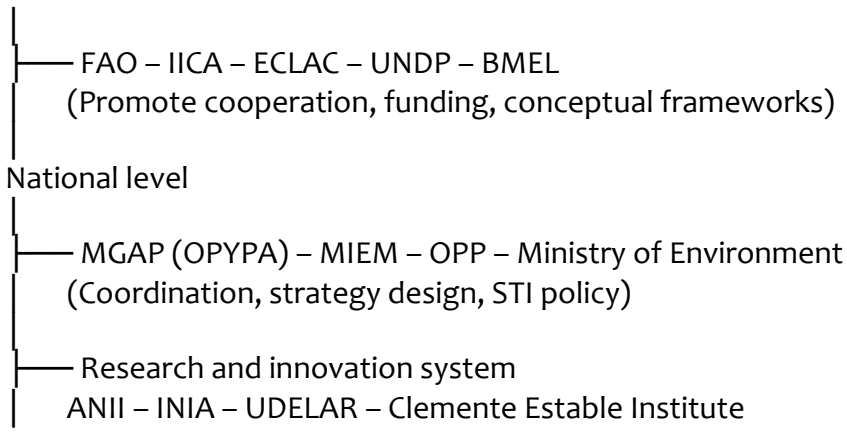
[12] Interviews conducted on 27/3/2023 with the General Directorate of Development of the Departmental Government (Intendencia) of Rivera.

With regard to the implementation of bioeconomy at the subnational level as noted by the perspective of actors like FAO, it is worth noting that there were opportunities depending on how emerging issues were approached. This was due to the presence of actors who carry out territorial articulation, such as INIA and UDELAR. It is important to consider the incentives that research institutions (ANII, UDELAR, INIA, etc.) might propose to promote approaches that could foster a strategic discussion.[13] In several interviews and during the focus groups with various experts, the significant role of science, technology, and innovation in advancing a socio-technical model that surpasses current limitations was specially acknowledged.[14]

In terms of contrasting paradigms that enable changes, the agroecology approach emerged in this context as a vision relatively close to that of bioeconomy. According to the interpretation of referents from the National Plan of Agroecology anchored in MGAP, both approaches would be part of a paradigm shift, though they still have a long way to go in terms of demonstrating their economic sustainability. According to this perspective, both paradigms would represent "two circles that intersect over a very large surface, while also having unique aspects".[15] In general terms, in the view of many interviewed referents of different organizations, agroecology approaches in Uruguay placed emphasis on production by small and medium-sized family producers, as well as urban gardens. Conversely, bioeconomy was more closely linked to larger companies.

Summarizing the governance dynamics discussed above, Figure 2 provides a schematic representation of the multilevel and multi-actor interactions shaping the bioeconomy in Uruguay, capturing both the institutional complexity and the emerging coordination challenges.

Figure 2: Governance Levels and Actor Interactions in Uruguay's Bioeconomy



[13] Interviews conducted on 6/3/2023 with FAO representatives in Uruguay.

[14] Interviews conducted on 5/15/2023 with MIEM representatives; on 3/6/2023 with FAO representatives in Uruguay; on 3/24/2023 with National Agroecology Plan (MGAP) representatives; and on 3/27/2023 with OPYPA (MGAP) representatives. Focus groups conducted on 10/18/2022 and on 11/8/2022.

[15] Interviews conducted on 24/3/2023 with National Agroecology Plan (MGAP) representatives.

(Knowledge production, applied research)

Subnational/Territorial level

- Departmental governments (e.g. Rivera)
  (Limited articulation; focus on circular economy)
- Civil society, cooperatives, producer unions
  (Emerging actors; agroecology linkages)

Conclusions

The research project analyzed in this paper aimed to address the question of the feasibility of the bioeconomy approach as a strategy for sustainable human development in the Northeastern Region of Uruguay, a region characterized by socio-economic asymmetries and backwardness with respect to the rest of the country, combined with remarkable economic-productive dynamics. The project aimed to analyze the potential of bioeconomy to promote sustainable human development, both theoretically and empirically, considering the current national policies as well as the perceptions of actors involved in this territory.

Regarding the question posed by the project, the approach was influenced by the polysemous nature of the bioeconomy concept and its implications: as previously mentioned, the task of addressing this notion in a systematic way, given its inherent complexity, is linked to the challenge of implementing actions aimed at its development as a productive paradigm. However, the challenges related to its semantic scope do not preclude the establishment of an operational definition. During the project development, the research team agreed upon the categorization proposed by the Global Bioeconomy Summit of 2018. In this view, bioeconomy refers to the sustainable production, utilization, and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes, and services in all economic sectors and in search of a sustainable economy. According to Henry, Hodson de Jaramillo, Aramendis, Trigo, and Rankin (2019), the integration of the bioeconomy approach requires a dynamic and complex social transformation process, where long-term policies play a crucial role. This concept of a sustainable bioeconomy is linked to a vision of the 'biologization of the economy' with new bio-based industrial processes and products, which entail changes in consumer behavior.

This definition served as the basis for developing both the quantitative and qualitative components of the project, where the Governance dimension was addressed within the second component through techniques such as bibliographic review, focus groups and interviews. The findings related to this issue in Uruguay and in the Northeast region of the country suggest that in the field of bioeconomy it would be beneficial to design public policies capable of catalyzing processes, ideas, and actors in a long-term project. Based on the analysis of primary and secondary

information collected until the end of the project in August 2023, it appeared that a clear governance scheme for bioeconomy in Uruguay was not feasible at this time. However, it was also evident that promoting bioeconomy as a paradigm had the potential to enhance sustainable human development processes in the analyzed territory.

In fact, intertemporal inconsistency in policies and a fragmentation of efforts among diverse actors were observed in the actions related to bioeconomy during this period. While the National Development Strategy 2050 proposed in 2019 explicitly included bioeconomy as a component of a medium and long-term development project, it appeared that this was not the case when the CSIC project finished.

As previously mentioned, the interviews' testimonies suggested some uncertainty regarding the country's capacity to promote the bioeconomy approach. This uncertainty was manifest both at the level of public policies and socio-productive actors. One evident aspect was the absence of guidance for a Science, Technology, and Innovation (STI) policy. Such guidelines could potentially direct knowledge production and research agendas towards bioeconomic topics, as well as promote local technological development processes, promoting learning and innovation in the country. At the national level, increasing knowledge and capabilities regarding bioeconomy were widely acknowledged. However, at the territorial level, there was some uncertainty related to this issue.

As it can be seen from the above considerations, the public actors that, due to their expertise, should have provided stronger incentives to these processes belonged mainly to the national level, such as the MGAP (especially OPYPA), and MIEM. It can be said that even if bioeconomy was then not one of their central priorities, it may still be an area of significant potential in the future. Due to the Lacalle Pou administration's approach, it was challenging for the OPP to serve as a coordinating body for a development promotion policy focused on the bioeconomy. It was apparent that at this time there was a lack of clear guidelines or impulses from the national level to the territorial levels, which suggested a lack of incentives for the promotion of a bioeconomy model.

It is noteworthy that from an agro-ecological perspective, civil society nuclei and social movements emerged as actors with different views regarding the degree of complementarity or opposition to the bioeconomy paradigm. Nonetheless, the National Agroecology Plan’s authorities considered them complementary. In terms of stakeholders, cooperatives also emerged as actors that could embody opportunities for the development of bioeconomy in sectors such as dairy and grains. In general, the sectors that were visualized as being closer to the bioeconomy approach were agriculture and agro-industry, especially sectors such as livestock, forestry and agriculture, with a specific mention of rural and sustainable tourism within the framework of certain territorial specificities.

Lastly, the results presented in the previous sections suggest that the interdisciplinary approach deployed during this project was relevant, as it involved a

team with highly diverse profiles. Furthermore, those results underline the importance of a multi-level and multi-actor approach in discussing potential governance schemes related to bioeconomy for the Northeast region of Uruguay.

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